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EATON 2075
NOISE-GAIN ANALYZER

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2075 NOISE-GAIN ANALYZER
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EATON

Eaton Corporation
Electronic Instrum
Los Angeles, Calif

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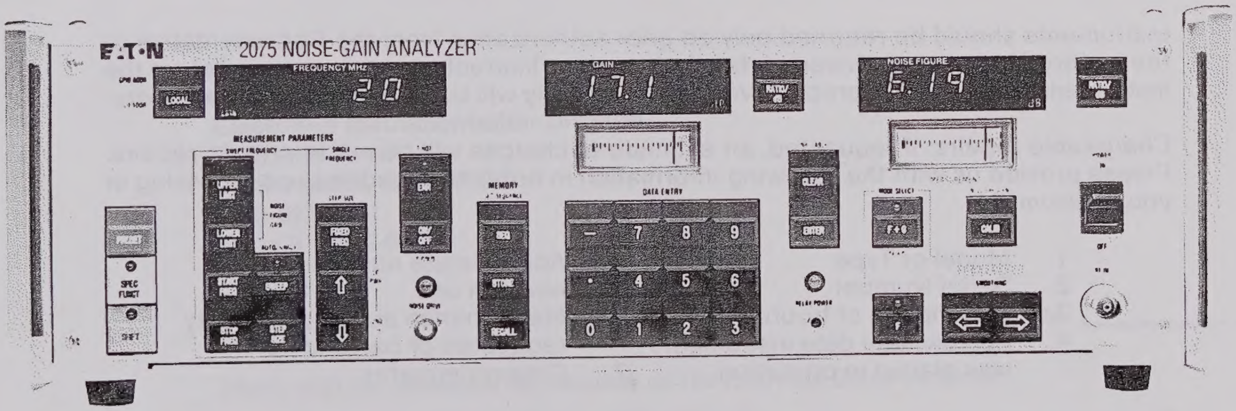
OPERATION MANUAL

Manual No. 1-500783-385

EATON 2075
NOISE-GAIN ANALYZER



EATON
2075 NOISE-GAIN ANALYZER
FREQUENCY MHz
20
GAIN
17.1
NOISE FIGURE
6.19
dB
LOCAL
MEASUREMENT PARAMETERS
SWEEP FREQUENCY
SINGLE FREQUENCY
UPPER LIMIT
LOWER LIMIT
START FREQ
SWEEP
STOP FREQ
STEP SIZE
FIXED FREQ
MEMORY
DATA ENTRY
CLEAR
ENTER
CALB
PRESET
SPEC FUNCT
SHIFT
ENR
ON/OFF
SEQ
STORE
RECALL
RATIO/dB
MODE SELECT
F+G
7 8 9
4 5 6
0 1 2 3

REVISED DECEMBER 1985

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Electronic Instrumentation Division
Los Angeles, California 90066

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SECTION I

GENERAL INFORMATION

1-1. SCOPE AND ORGANIZATION OF THE MANUAL

This manual contains information and procedures required to install and operate the Eaton 2075-2A Noise-Gain Analyzer. The manual is divided into five sections as follows:

Section 1: General Description

Section 2: Unpacking and Installation

Section 3: Operation In Local Mode

Section 4: GPIB Operation

Section 5: Performance Verification Procedures

NOTE

Eaton 2075 is the generic model designation for the Noise-Gain Analyzer. It was first released as the Eaton 2075-2; the most recent version is the Eaton 2075-2A. Both versions are identical in form, fit and function except that in the Eaton 2075-2A the basic input frequency range has been extended. The Eaton 2075-2 has an input frequency range of 10 MHz to 1800 MHz. The basic input frequency range of the Eaton 2075-2A is 10 MHz to 1850 MHz, per its specifications. However the unit is tunable to, and can actually be operated at, up to 1900 MHz. The actual model number is located on the identification label on the rear panel. The instrument is hereinafter referred to as the Eaton 2075.

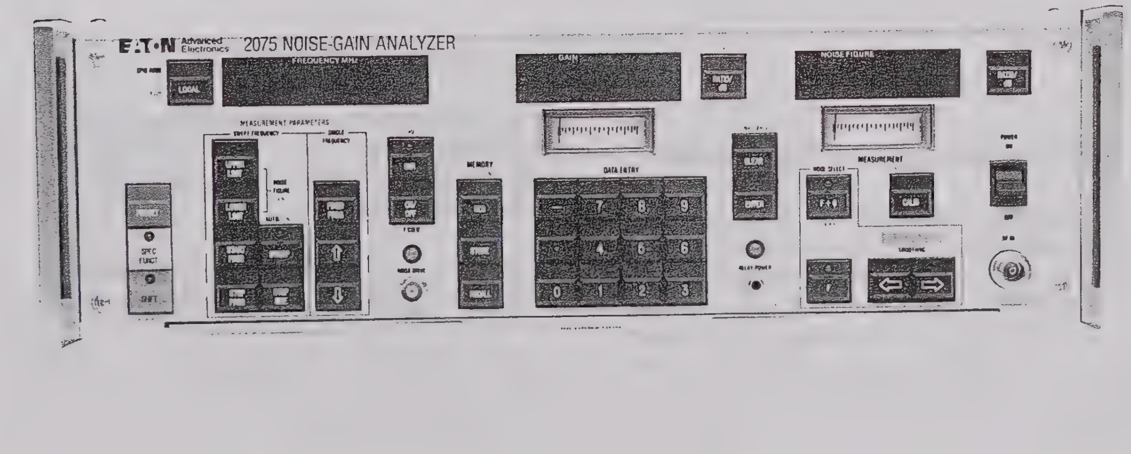

EATON Advanced Electronics
2075 NOISE-GAIN ANALYZER
FREQUENCY MHz
GAIN
NOISE FIGURE
LOCAL
MEASUREMENT PARAMETERS
MEMORY
DATA ENTRY
MEASUREMENT
SPEC FUNCT
SHIFT
7
8
9
4
5
6
0
1
2
3

Figure 1-1. EATON 2075 NOISE-GAIN ANALYZER

This manual has been organized to allow the new user of the Eaton 2075 to quickly and easily begin test operations. Read Section 1 to obtain a familiarity with the test instrument. Follow the procedures of Section 2 for installation.

The Eaton 2075 can be used in any of 6 test configurations, depending on the desired test application. Section 3 is organized to quickly bring the user to the correct test configuration and its procedure. Figure 3-1 and Table 3-1 may be studied to obtain a familiarity with the controls and indicators. Paragraph 3-10 and Table 3-4 guide the user in selecting the correct test configuration. Paragraphs 3-11 through 3-18 are the procedures to be used with each configuration. Each procedure includes the keystroke sequences necessary for each step. The remaining pages of Section 3 cover, in greater detail, specific subjects relevant to operation of the 2075.

Section 4 covers operation when the 2075 is controlled by an external computer via a General Purpose Interface Bus.

Section 5 includes information and procedures used to verify that the 2075 is performing correctly.

1-2. INTRODUCTION

This section of the manual contains a general description of the Eaton 2075 Noise-Gain Analyzer including: purpose and function, equipment requirements, available options, specifications, and safety precautions.

1-3. PURPOSE AND USE OF EQUIPMENT

The 2075 Noise-Gain Analyzer is a programmable, microprocessor-controlled instrument designed specifically to make precise measurements of noise and gain characteristics of RF devices. The analyzer can be controlled in its local mode using its front panel controls, or in the remote mode, by an external controller via an IEEE-488 GPIB (General Purpose Interface Bus).

The analyzer can make the following measurements:

Corrected Noise Figure and Gain	(F + G)*
Uncorrected Noise Figure	(F)*
Corrected Effective Input Noise Temperature and Gain	(T_e + G)
Effective Input Noise Temperature	(T_e)
Corrected Effective Operating Noise Temperature and Gain	(T_{op} + G)
Effective Operating Noise Temperature	(T_{op})
Noise Measure (includes Gain)	(M)*
Y Factor	(Y)*
Power	(PWR dB)*
Excess Noise Ratio	(ENR)*

*Can be displayed in dB or as a dimensionless ratio

The specified input frequency range of the 2075 extends from 10 MHz to 1850 MHz. However, the unit is actually tunable and operable to 1900 MHz. In its simplest test configuration the analyzer will make measurements of RF devices with output frequencies in this range. More complex test configurations, requiring one or two stages of external downconversion, allow measurements of devices with output frequencies as high as 65.535 GHz. The 2075 has the capability for controlling the local oscillator used in the external downconversion process.

1-4. CALIBRATION CYCLE

At six month intervals the Performance Verification Procedures in Section 5 of this manual should be performed to ensure the continued optimum performance of the 2075.

At one year intervals the instrument should be fully calibrated using the alignment and adjustment procedures from the maintenance manual. These procedures should be performed by qualified personnel experienced in calibration and servicing of electronic instrumentation.

1-5. EQUIPMENT SUPPLIED

The items listed in Table 1-1 are furnished with the 2075 Noise-Gain Analyzer.

Table 1-1. Equipment Supplied

QTY.	DESCRIPTION	PART NO.
1	AC Power Cord, 2 meters	1-910166-001
1	External Relay Plug	1-910417-101
1	Fuse, 1.0 Amp, slow-blow (for 220V operation)	1-924000-019
1	Operation Manual	500783-385
1	Maintenance Manual	500783-386

1-6. EQUIPMENT REQUIRED BUT NOT SUPPLIED

One or more noise sources are required for operation of the 2075. The type needed depends on the user applications. Also, one or more GPIB cables are required to operate the 2075 if an external controller is used, or if the 2075 is used to control an external local oscillator. Noise sources and GPIB cables are listed in Table 1-2 under Optional Accessories.

In addition, filters, mixers, and one or two external local oscillators may be required if the Device Under Test is to be measured at frequencies above 1850 MHz. See Sections 3-10 through 3-18 to determine the proper setup and equipment requirements.

Test equipment is required for the performance of the Performance Verification Procedures. The required test equipment is listed in Table 5-1 of this manual.

1-7. OPTIONAL ACCESSORIES

Table 1-2 lists the optional accessories available for use with the 2075 Noise-Gain Analyzer. For further information, please contact an Eaton sales representative in your area.

NOTE

Item 23, the Slide Mount Kit, must be ordered with the original purchase of the 2075. This option cannot be added later unless the unit is returned to the factory.

Table 1-2. Optional Accessories

ITEM NO.	DESCRIPTION	MODEL NO.
1	Solid State Noise Source 10 MHz-1500 MHz	7615
2	Solid State Noise Source 1 GHz-12.4 GHz	7616
3	Solid State Noise Source 12.4 GHz-18 GHz	7617
4	Solid State Noise Source 1 GHz-18 GHz	7618
5	Solid State Noise Source 10 MHz-18 GHz	7618E
6	Solid State Noise Source 10 MHz-26.5 GHz	7626
7	Solid State Noise Source with isolator, 1.2 GHz-1.4 GHz	230450-2
8	Solid State Noise Source with isolator, 2.7 GHz-2.9 GHz	230450
9	System Noise Source (High ENR) 10 MHz-18 GHz (Custom Specifications)	7650
10	System Noise Source (High ENR) 10 MHz-18 GHz (Custom Specifications)	7660
11	Triggerable Power Supply for Gas Discharge Noise Sources	7175
12	Gas Discharge Noise Source 8.2 GHz-12.4 GHz, WR90 output	7052
13	Gas Discharge Noise Source 12.4 GHz-18 GHz, WR62 output	7091
14	Gas Discharge Noise Source 18 GHz-26.5 GHz, WR42 output	7053
15	Gas Discharge Noise Source 26.5 GHz-40 GHz, WR28 output	7096
16	Hot/Cold Noise Standard DC-9 GHz	7009
17	GPIB Cable, 1 Meter Length (IEEE-488)	1-998094-001
18	GPIB Cable, 2 Meter Length (IEEE-488)	1-998094-002
19	GPIB Cable, 4 Meter Length (IEEE-488)	1-998094-003
20	Maintenance Kit for Eaton 2075 (Extender Boards and Cables)	1-006586-001
21	Anti-Static Workstation	1-998484-001
22	Rack Mount Kit	Option 11
23	Slide Mount Kit (see note above) (Option 11 also required)	1-998725
24	PROM ENR Table (permanent storage of ENR data for noise source)	Ordered as option with noise source

1-8. SPECIFICATIONS

Specifications for the 2075 are listed in Tables 1-3 and 1-4. Table 1-3 lists the basic specifications. Supplemental information consisting of non-warranted, nominal performance characteristics is listed in Table 1-4.

Table 1-3. Eaton 2075 Performance Specifications

PERFORMANCE CHARACTERISTIC	LIMIT	CONDITIONS
NOISE FIGURE MEASUREMENT:		
Range	0 to 30 dB	
Resolution	0.01 dB	
Uncertainty	±0.05 dB	1) Noise Figure 0 to 12 dB 2) Temperature +10 to +40 ° C 3) ENR of 5 to 18 dB
	±0.10 dB	1) Noise Figure >12 dB 2) Temperature <10 ° C >40 ° C
GAIN MEASUREMENT:		
Range	−20 dB to +50 dB	
Resolution	0.01 dB	
Uncertainty	±0.2 dB	
INPUT:		
Frequency Range	Specified parameters apply from 10 MHz to 1850 MHz. Unit is tunable and operable up to 1900 MHz	

Table 1-3. Eaton 2075 Performance Specifications (Continued)

PERFORMANCE CHARACTERISTIC	LIMIT	CONDITIONS
Frequency Resolution	1 MHz (test configurations 1 - 6) 0.1 MHz (test configuration 1 only)	
Tuning Accuracy	±(0.5 MHz + 0.005 times the tuned frequency ±3 MHz maximum	
Second Stage Noise Figure	7 dB +.001 dB/MHz	For input power levels below -40 dBm
Input SWR	<1.5:1	
Reflection Coefficient	<0.2	
Allowable Net External Gain	>75 dB	
ELECTROMAGNETIC COMPATIBILITY:		
Conducted and Radiated Emissions	MIL STD 461A, CISPR Publication 11, and Messempfaenger-Postverfuegung 526/527/79	Conducted and radiated interference complies with MIL STD 461A, Methods CE03 and RE02, CISPR Publication 11 (1975), and Messempfaenger Postverfuegung 526/527/79 (Kennzeichnung Mit F-Nummer/Funkschutzzeichen)
Conducted and Radiated Susceptibility	MIL STD 461A 1968	Conducted and radiated susceptibility meets the requirements of methods CS01, CS02, CS06, and RS03 (1 Volt/meter) of MIL STD 461A 1968
GENERAL:		
Noise Source Drive Voltage	28.0 volts + .05 V 1.0 volt	Noise Source ON at up to 100 mA peak Noise Source OFF
Line Voltage	100 VAC ± 10% 110 VAC ± 10% 220 VAC ± 10% 240 VAC ± 10%	48 to 66 Hz 48 to 66 Hz 48 to 66 Hz 48 to 66 Hz
Power Dissipation	200 VA maximum	
Operating Temperature	0 to 55 ° C	
Storage Temperature	−55 to +75 ° C	
Height	146 mm (5.75 in.)	5¼ in. vertical rack space
Width	425 mm (16.8 in.)	
Depth	354 mm (14.0 in.)	
Weight	11.5 kg (25.5 lbs.)	

Table 1-4. Supplemental Specifications

CHARACTERISTIC	NOMINAL OR TYPICAL VALUE	
Bandwidth	5.0 MHz Noise Bandwidth	
Maximum Safe Input Level	+20 dBm RF or ±20 VDC	
External Relays Drive Voltages and Currents	+5 VDC , 5 VA maximum +15 VDC, 4.5 VA maximum +30 VDC, 15 VA maximum	
Controller Functions	HP 8672A, HP 8350A, Wiltron 6600 Series Sweep Generators, General Format	
ENR Tables Storage Capacity	3 Tables, each can store up to 31 frequencies with corresponding ENR values, plus 1 PROM table can store 1 ENR value for all frequencies (4 tables total). An additional, optional PROM table can be ordered with the noise source.	
Frequency Display	Displays Frequency in MHz, 4 GPIB annunciators are:	
	SRQ	Service Request
	RMT	Remote
	TALK	Talk
	LISTEN	Listen
	4 Parameter Annunciators are:	
	LO	Local Oscillator
	RF	Radio Frequency
	IF	Intermediate Frequency
	ENTER	Enter Frequency Prompt
Gain Display	Displays Gain and other values. The 8 Annunciators are:	
	LOSS	Gain is less than zero dB
	ENR	Excess Noise Ratio
	T (F)	Temperature in Fahrenheit
	T (C)	Temperature in Centigrade
	T (K)	Temperature in kelvins
	ENTER	Enter Value Prompt
	dB	Units are displayed in dB
	RATIO	Units are displayed as Ratio
Noise Figure Display	Displays Noise Figure and other values. The 8 Annunciators are:	
	F	Noise Figure
	Y	Y-Factor
	T_e(K)	Effective Input Noise Temperature in kelvins
	dB PWR	Power and ENR
	M	Noise Measure
	T_{op}	Operating Noise Temperature
	dB	Units displayed are in dB
	RATIO	Units displayed as Ratio
Analog Gain Meter	Analog Indicator for Gain. Variable range is set by entering upper and lower limits.	

Table 1-4. Supplemental Specifications (Continued)

CHARACTERISTIC	NOMINAL OR TYPICAL VALUE
Analog Noise Meter	Analog Indicator for Noise Figure. Variable range is set by entering upper and lower limits.
Scope/Plotter Output Connectors X, Y, Z	Rear panel connectors supply drive signals for external oscilloscope or X-Y plotter. Variable range is set by entering upper and lower limits. Output voltage range is 0 to 6 volts for X and Y. Z axis output is positive going TTL, 0 to 5 volts signal for blanking the oscilloscope.
IF Output	- 25 dBm to - 55 dBm, 5 MHz Bandwidth
DET Output	.2 volts to approx. + 5 volts, high impedance output

1-9. SAFETY PRECAUTIONS

WARNING This symbol designates precautionary actions which must be followed to avoid the possibility of injury and death.

WARNING

1. If this instrument is to be energized via an auto-transformer for voltage reduction, make sure that the common terminal is connected to the earth pole of the power source.
2. The power cable plug shall be inserted into a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord without a protective conductor (ground).
3. Before switching on the instrument, the protective earth terminal of the instrument must be connected to the protective conductor of the power cord. This is accomplished by ensuring that the instrument's internal earth terminal is correctly connected to the instrument's chassis and that the power cord is wired correctly.
4. Whenever it is likely that the protection has been impaired, the instrument must be made inoperable and secured against any unintended operation.
5. Any interruption of the protective ground conductor inside or outside the instrument, or disconnection of the protective earth terminal is likely to make the instrument dangerous. Intentional interruption is prohibited.
6. Make sure that only fuses with the required rated voltage and current, and of the specified type (normal-blow, slow-blow) are used for replacement. The use of repaired fuses and the shortcircuiting of fuseholders must be avoided. Remove the line cord before changing fuses.
7. Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, where inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

8. Exercise extreme care when servicing the unit. High voltages are used.

9. Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source.

CAUTION This symbol designates precautionary actions which must be followed to avoid damage to all or part of the instrument.

CAUTION

1. Verify that the line voltage selector card on the rear panel is in the correct position before connecting the power.

2. Verify that the socket for the power line cord is provided with a protective earth contact.

3. Any interruption of the protective (grounding) conductor inside or outside the instrument is likely to cause damage to the instrument. To avoid damage, this instrument and all line powered devices connected to it must be connected to the same earth ground.

4. Make sure that only fuses with the required rating, and of the specified type, are used for replacement. Fuse ratings are given on the rear panel of the instrument near the fuseholder.

5. To avoid the possibility of damage to test equipment, read completely through each section before starting it. Make any preliminary control settings necessary for correct test equipment operation.

6. Do not torque the RF connector to more than 2½ inch-pounds.

SECTION 2

INSTALLATION

2-1. INTRODUCTION

This section of the manual contains information required for unpacking, inspecting, and installing the Eaton 2075 Noise-Gain Analyzer.

2-2. UNPACKING AND PHYSICAL INSPECTION

Examine the shipping carton for damage before unpacking the equipment. If the carton has been damaged, have the carrier's agent present when the equipment is removed from the carton. Retain the shipping carton and padding material for the carrier's inspection if damage to the equipment is evident after it has been unpacked.

CAUTION

Exercise care when removing the instrument from its shipping container to ensure that no damage is incurred at this time.

See that the equipment is complete as listed on the packing slip. Visually examine the 2075 for any evidence of physical damage. If any damage is evident, or if the contents are not complete, immediately notify the carrier and also your local Eaton sales office. After completing the physical inspection, the Performance Verification Procedures in Section 5 of this manual should be performed as an operational or electrical inspection.

2-3. AC POWER REQUIREMENTS

Prior to shipping, the 2075 is configured to operate on 120 VAC, 60 Hz line power. The unit is easily reconfigured for operation using 100, 220, or 240 VAC. Refer to Figure 2-1 below and perform the following steps to verify, or to change, the line voltage configuration:

WARNING

Observe all the safety precautions listed in paragraph 1-9. In particular, determine that the line voltage selector card is set to its correct position. If it is necessary to change the card setting, use the following procedure.

NOTE

For units with serial numbers 286 and up, it makes no difference whether the unit is configured for 100 or 120 VAC. Likewise, it makes no difference whether the unit is configured for 220 or 240 VAC.

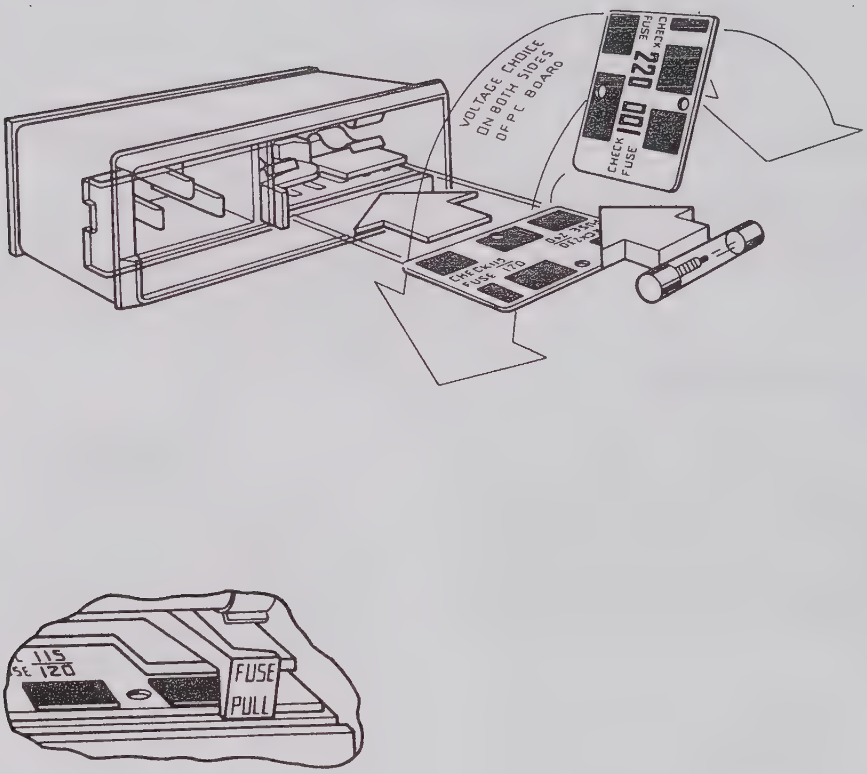


Figure 2-1. AC VOLTAGE SELECTION CARD

1. On the rear of the unit, locate the receptacle for the line power cord. The power cord should be unplugged from the receptacle.
2. Slide the transparent fuse cover to the left, and pull the FUSE PULL lever to remove the fuse.
3. Read the voltage level printed on the voltage selector card. (This number becomes visible after the fuse is removed.)
4. The unit is normally configured for 120 VAC operation. If the unit is to be operated using this line voltage, verify that this value is visible. Verify that the fuse rating is 2.0 Amps, slow-blow, and reinsert the fuse.
5. To reconfigure for operation at 100, 220, or 240 VAC, remove the voltage selector card. A small hole is provided in the card to accommodate a hook for easy removal.
6. Rotate the card so that the desired operating voltage is visible on its upper surface. Now position the card for reinsertion with the desired voltage on the outboard edge.
7. Reinsert the card. The desired voltage should be visible.
8. Replace the fuse after verifying that its rating is correct. For 100 or 120 VAC, use the 2.0 Amp slow-blow fuse. For 220 or 240 VAC, use the 1.0 Amp slow-blow fuse.
9. Slide the transparent fuse cover back into place.
10. Plug the power cord into the receptacle.

WARNING

The power line cord is a 3 wire assembly to ensure that the instrument chassis is connected to the main ground. Under no conditions is this ground lead to be interrupted, or a 2 wire extension cord to be used.

CAUTION

Observe all the safety precautions given in paragraph 1-9.

2-4. OPERATIONAL INSPECTION

After verifying that the 2075 is configured for the correct line voltage, the unit should be subjected to the Performance Verification Tests in Section 5 of this manual. After completion of these tests, the unit is ready for bench-top operation.

2-5. OPERATING TEMPERATURE

The 2075 is designed to operate within specified performance limits over an ambient temperature range extending from 0 to 55 degrees Centigrade. Operation outside this range for extended periods will result in degradation of electrical performance and eventual malfunction.

2-6. SELECTION OF RELAY DC VOLTAGE

The RELAY POWER connector on the 2075 front panel provides voltage to automatically energize external relays during Second Stage Calibration.

This voltage is jumper selectable and can be set to +5, +15, or +30 volts DC. It is set to +30 volts before the unit is shipped from the factory. Refer to Figure 2-2 and perform the following steps to select +5 or +15 volts DC.

CAUTION

Observe all the safety precautions given in paragraph 1-9 for protection of the instrument and of personnel.

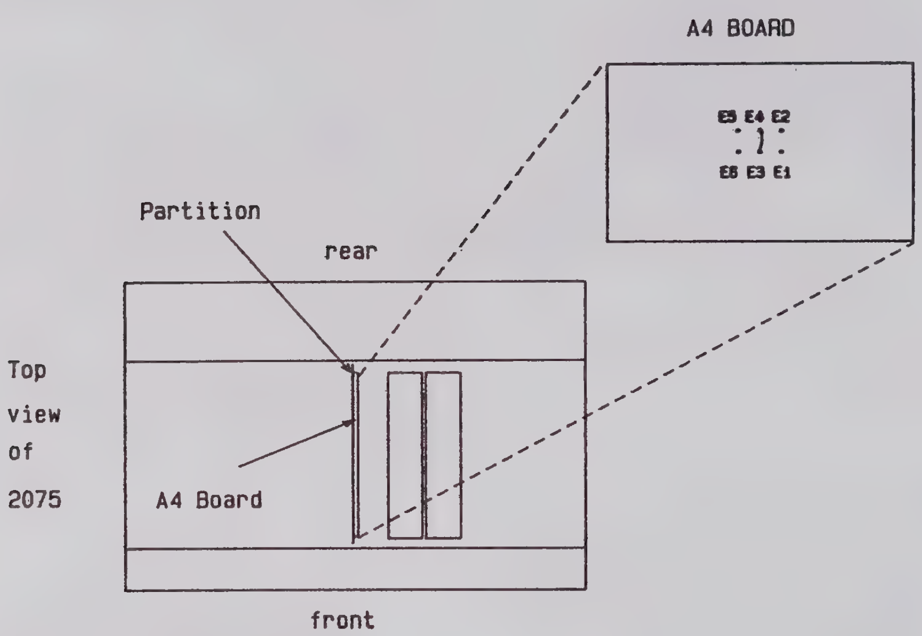


Figure 2-2. EXTERNAL RELAY VOLTAGE SELECTION

1. Remove the AC power cord from its receptacle on the rear of the 2075.
2. Remove the single 6-32 screw which secures the top cover panel. Slide the cover to the rear of the unit and remove it.
3. Two internal covers are exposed. Remove the nine 4-40 screws which secure the right side internal cover (the RF Deck Cover) and remove the cover.
4. Locate the A4 board. Its position is shown in Figure 2-2 above.
5. Remove the three board holding screws which are located along the top edge of the board.
6. Unplug the connectors located near the top edge of the board, as necessary, so that the board can be removed. Lift the board free of its edge connector.
7. Locate the pins E1 through E6. These are located in the center of the board as shown in Figure 2-2 above. A jumper is installed between pins E3 and E4, selecting +30 volts.
8. To select +5 volts, connect the jumper between pins E5 and E6. To select +15 volts, connect the jumper between pins E1 and E2.
9. To reassemble the unit perform steps 1 through 6 in reverse.

2-7. EQUIPMENT MOUNTING

The 2075 comes equipped with four supporting feet to allow bench-top operation. The unit may also be mounted in a standard 19 inch equipment rack on angled support brackets or on sliding mounts.

The rack mounting kit, Option 11, consists of two front panel brackets and the necessary screws for attaching the brackets to the 2075.

The Slide Mount Kit, part number 1-998725, consists of the two slide mount assemblies and the required mounting screws. Both kits are required for mounting the unit on slides. For rack mounting on angled brackets, only Option 11 is required.

NOTE

The Slide Mount Kit option must be ordered when the 2075 is originally purchased. The unit is shipped with the slide mounts installed.

2-8. RACK-MOUNTING THE 2075

Refer to Figure 2-3 to attach the rack mount brackets to the 2075. Refer to Figure 2-4 for installation of the 2075 on slide mounts in a standard equipment rack.

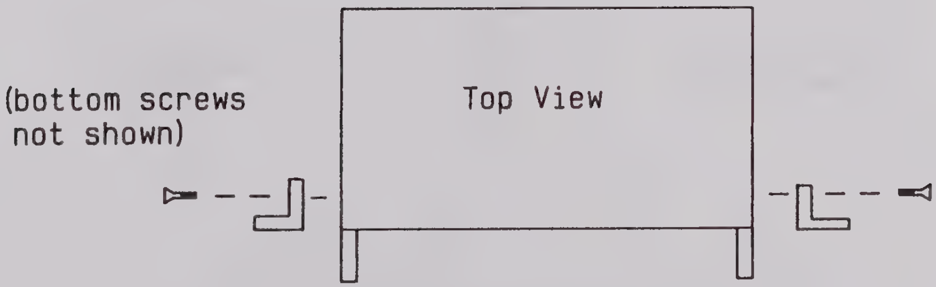
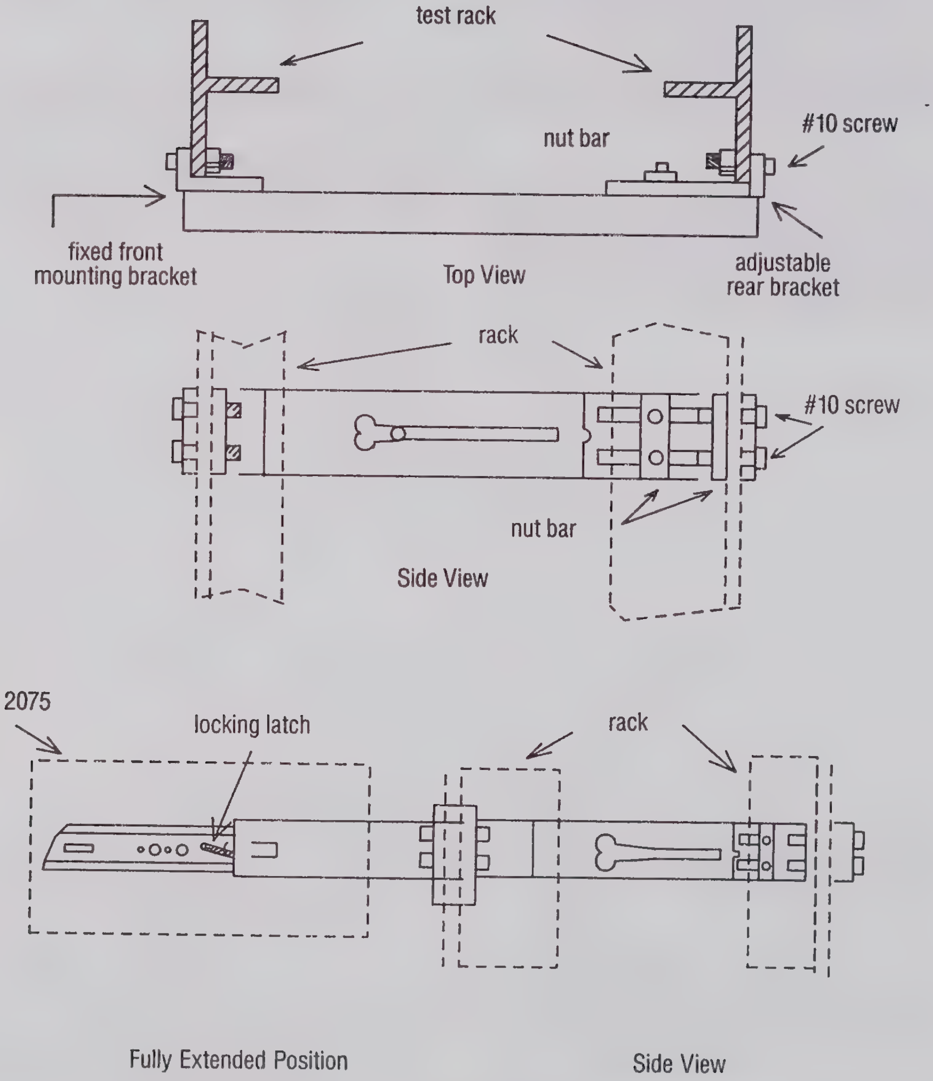


Figure 2-3. INSTALLATION OF RACK MOUNTS


test rack
nut bar
#10 screw
fixed front mounting bracket
Top View
adjustable rear bracket
rack
#10 screw
nut bar
Side View
2075
locking latch
rack
Fully Extended Position
Side View

To remove 2075 from rack or to push 2075 back into rack, lift locking latch first. Note that the adjustable bracket is the rear one.

NOTE: Slide mounts are manufactured by Grant Hardware Corporation, City of Industry, CA
Code No. 10003; P/N SS-168-NT-18

Figure 2-4. INSTALLATION OF SLIDE MOUNTS
(Eaton P/N 1-998725-005)

2-9. EQUIPMENT INTERCONNECTIONS

Refer to Figure 3-2 and Table 3-2 for the locations and additional information on the rear panel connectors discussed below. The 2075 has three BNC-type connectors on its rear panel. These provide X, Y, and Z outputs which may be used to display data on an oscilloscope or analog X-Y Plotter. Install test cables between these outputs and the corresponding oscilloscope or plotter inputs if this function is to be utilized. When an oscilloscope is being used to display data, the INT (intensity) adjustment on the rear panel should be adjusted fully clockwise initially, and then adjusted to obtain the desired difference in intensity between the noise figure and gain traces. When an X-Y plotter is being used, the Z output should be connected to the plotter pen-lift input. Refer to paragraph 3-42 for the procedures detailing usage of these functions.

The IF OUT connector is provided on the rear panel of the 2075 to allow measurement or display of the 30 MHz IF signal. This signal is the result of the second stage of internal downconversion. Install a test cable between this BNC-type connector and an appropriate measurement device, if desired for test purposes.

The DET OUT connector is provided on the rear panel to allow measurement or display of the Final Detector Output voltage. Install a test cable between this BNC-type connector and an appropriate measurement device if desired for test purposes.

The line power receptacle on the Eaton 2075 rear panel is the input connector for AC power. Connect the line power cord to this receptacle.

A 24 pin GPIB connector is provided on the rear panel of the Eaton 2075. Connect the GPIB cable to this connector when using an external computer to control the Eaton 2075, when using the Eaton 2075 to control an external local oscillator, or when transmitting data to a printer. Figure 2-5 and Table 2-1 illustrate the GPIB connector pin layout.

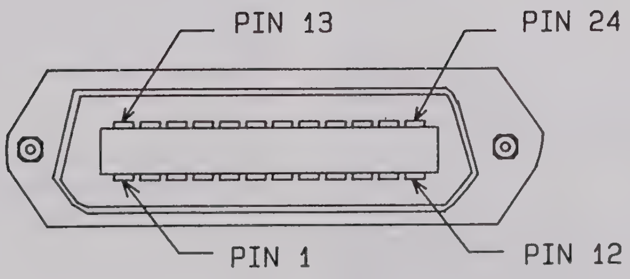


Figure 2-5. GPIB CONNECTOR

Table 2-1. GPIB Connector Pin-Out

PIN #	SIGNAL	PIN #	SIGNAL
1	DIO 1	13	DIO 5
2	DIO 2	14	DIO 6
3	DIO 3	15	DIO 7
4	DIO 4	16	DIO 8
5	EIO	17	REN
6	DAV	18	Signal Ground for pin 6
7	NRFD	19	Signal Ground for pin 7
8	NDAC	20	Signal Ground for pin 8
9	IFC	21	Signal Ground for pin 9
10	SRQ	22	Signal Ground for pin 10
11	ATN	23	Signal Ground for pin 11
12	SHIELD	24	Signal Ground for LOGIC

2-10. REFERENCE CARD

A quick reference pull-out card is located in the bottom of the 2075. This card summarizes information on special functions, test configurations, and error messages.

2-11. PRE-OPERATIONAL ADJUSTMENTS

The Performance Verification Procedures in Section 5 of this manual should be performed before making measurements with the 2075. These procedures constitute an operational or electrical inspection of a newly purchased unit and they can easily be performed in less than 10 minutes. Two of these procedures, the IF Attenuators Calibration (paragraph 5-6) and the Entry of Noise Source Calibration Data (ENR values and frequencies, part of paragraph 5-7) must be performed on a newly purchased unit prior to use.

No other pre-operational adjustments are required.

SECTION 3

OPERATION

3-1. INTRODUCTION

This section of the manual contains information and procedures necessary to operate the Eaton 2075 Noise-Gain Analyzer. The 2075 is microprocessor-controlled using ROM resident firmware. It has an extremely wide range of capabilities and many of the front panel controls have multiple functions. This section of the manual is organized to simplify the process of learning how to operate the 2075, and to rapidly bring the new user to the process of making measurements.

Figure 3-1 and Table 3-1 show the front panel controls and indicators together with their functions and the corresponding keystroke sequences. Figure 3-2 and Table 3-2 show the rear panel controls and indicators together with their functions.

After inspecting and installing the 2075, use the procedure of paragraph 3-9 to enter ENR (Excess Noise Ratio) values. All necessary keystroke sequences are included in the procedure.

The 2075 is used in any of six different test configurations. The type of Device Under Test (DUT) and its output frequencies determine which test configuration is required. This section of the manual contains stand-alone procedures for making measurements in each possible test configuration. Paragraph 3-10 and Table 3-4 serve as a guide to selecting the needed configuration. Table 3-4 also directs the user to the paragraph containing the complete measurement procedure for the needed configuration. Each procedure includes the necessary steps, the control functions used, and the exact keystroke sequences to perform each function. These procedures are basic to making any automatic measurement.

The paragraphs following the test configuration procedures give detailed information on the various subjects relevant to usage of the 2075.

3-2. CAPABILITIES OF THE EATON 2075

The 2075 is fully compatible with the IEEE-488 General Purpose Interface Bus (GPIB). The instrument may be operated in any of three modes: LISTENER/TALKER, TALK ONLY, and LIMITED CONTROLLER.

In LISTENER/TALKER mode, an external controller controls the 2075 via an IEEE-488 GPIB. When the instrument is powered-up, it assumes this mode and is immediately addressable by the external controller. See Section 4 of this manual.

The TALK ONLY (TALK ALWAYS) mode is used to send measurement data to a GPIB compatible printer or other listener device. In this mode no external controller is used and all control of the 2075 is accomplished via the front panel.

The LIMITED CONTROLLER mode is the mode wherein the 2075 controls the frequency and power of a GPIB compatible, external signal source which is used as a local oscillator. The 2075 can use one of several ROM resident programs to control different models of signal sources. It also allows the user to write and enter a custom program via the front panel. No external controller is used while in this mode and all control of the 2075 is accomplished through the front panel.

In any mode, the 2075 can drive an oscilloscope, X-Y plotter, or strip chart recorder to display results of gain or noise measurements. For more information see paragraph 3-42, page 3-89.

The input frequency range of the 2075 extends from 10 MHz to 1850 MHz. In the most basic test configuration, measurements can be made for devices having output frequencies in this range. Through use of one or two stages of external downconversion, measurements can also be made at RF frequencies up to 65.535 GHz (test configurations 2 through 6). Sideband parameters are user selectable allowing measurements to be made single upper sideband, single lower sideband, or double sideband.

The 2075 can make FIXED FREQUENCY or SWEPT FREQUENCY measurements.

FIXED FREQUENCY is the default mode after power-on, and it is the mode in which measurements are made at a single frequency. Before and after measurements, manual frequency increment/decrement keys can be used to tune the frequency up or down in steps. The step size is user selectable. See paragraph 3-6, page 3-21.

In SWEPT FREQUENCY mode, START FREQUENCY, STOP FREQUENCY, and SWEPT FREQUENCY STEP SIZE are entered by the user. The maximum number of measurement points in this mode is equal to the frequency range width in MHz, divided by the maximum frequency resolution. For example, if the measurement range extends from 10 MHz to 1850 MHz, giving a range width of 1840 MHz, dividing 1840 by the maximum frequency resolution of .1 MHz, gives 18,400 measurement points. See paragraph 3-7, page 3-22.

Swept frequency mode is selected by initiating either a SINGLE SWEEP or CONTINUOUS AUTOMATIC SWEEPS.

SECOND STAGE CALIBRATION is the procedure wherein the 2075 measures the noise figure of the entire measurement system, excluding the Device Under Test (DUT). The calibration data obtained is used by the instrument when making corrected (First Stage) measurements of the DUT. During SECOND STAGE CALIBRATION the 2075 can store up to 100 calibration points. The number of calibration points and their frequencies are determined by the measurement frequency parameters entered by the user. See paragraph 3-34, page 3-75.

The 2075 can make uncorrected (cascade) measurements or corrected (first stage) measurements. A cascade measurement gives a single value which includes the noise of the Device Under Test (the first stage) combined with the noise of the measurement system (the second stage). No Second Stage Calibration is necessary before making cascade measurements.

A corrected, or first stage measurement, is essentially a cascade measurement from which the noise contribution of the measurement system has been subtracted. A Second Stage Calibration must be performed before making a corrected measurement.

After power-up, the 2075 is in the cascade measurement mode by default. Performing the Second Stage Calibration automatically places the instrument into the corrected measurement mode.

Three ENR tables allow the storage of Frequency/ENR values for up to 3 different noise sources. Each table can store the ENR data for up to 31 frequencies. A fourth table stores a single ENR value which can be used for all frequencies. A fifth table can be provided by an optional PROM chip which contains frequency and ENR values for a specific noise source. See paragraph 3-9, page 3-26, and paragraph 3-30, page 3-71.

The 2075 can make the following automatic measurements:

Noise Figure	(F)	(Cascade only)
Noise Figure and Gain (or Loss)	(F+G)	(Corrected only)
Effective Input Noise Temperature	(T_e)	(Cascade or corrected)
Y-Factor	(Y)	(Cascade only)
Operating Noise Temperature	(T_{op})	(Cascade or corrected)
Power	(dB)	(Cascade or corrected)*
Excess Noise Ratio	(ENR)	(Cascade or corrected)*
Noise Measure	(M)	(Corrected only)

*Cascade measurements are not recommended for these.

The following measurements can be made manually:

Corrected Noise Figure and Gain (or Loss)	(F+G)	See Paragraph 3-27, page 3-67.
Cascade Noise Figure	(F)	See Paragraph 3-27, page 3-67.
Y-Factor	(Y)	See Paragraph 3-28, page 3-69.

The 2075 can store its front panel control parameters for later retrieval and reuse. Nine sets of control parameters can be stored and then sequentially or randomly retrieved. The retrieval sequence is user programmable. See paragraph 3-48, page 3-110.

A number of special functions, each with multiple subordinate functions, extend the range of the instrument's available features beyond those of the dedicated front panel controls. See paragraph 3-46, page 3-101.

The 2075 displays error messages in the event of a procedural or hardware error. See paragraph 3-47, page 3-106.

Loss or gain compensation is available wherein the 2075 compensates for known losses or gains that cannot be included in Second Stage Calibration. See paragraph 3-40, page 3-86.

Laboratory ambient temperatures can affect the accuracy of noise measurements. The 2075 allows compensation for variations in the cold or off temperature of the noise source and thereby increases measurement accuracy. See Tcold Compensation, paragraph 3-41, page 3-88.

The bandwidth of the DUT, relative to the measurement system, can be a factor affecting measurement accuracy. The 2075 provides a method of compensating for bandwidth differences when the bandwidth of the DUT is less than the measurement bandwidth of the 2075. See Bandwidth Compensation, Paragraph 3-38, page 3-82.

The allowable external gain of the DUT is normally 50 dB. Because this parameter is bandwidth dependent, allowable external gain can be increased to as much as 70 dB. See paragraph 3-35, page 3-77.

3-3. CONTROLS AND INDICATORS

The controls and indicators, and their functions, are listed in Table 3-1.

Because the 2075 offers such a wide range of available functions, a single key may initiate two or more functions. The primary function of such a key is indicated by the key label or designation. For example, the key **START FREQ** is used to allow display or entry of the start frequency for a swept measurement. The primary function of a key is initiated by pressing that key once.

Where a key has a secondary function, this function is indicated by the orange lettering above or beside the key. For example, the key **START FREQ** has a secondary function which allows display or entry of an IF frequency from an external mixer. Accordingly, the orange designation, IF, is located just to the left of the key. The secondary, or shift function of a key is initiated by pressing the orange **SHIFT** key first, and then the function key. For example, to enter or display the IF frequency, press **SHIFT** and then **START FREQ.**

In addition to the primary and secondary functions, some keys have a tertiary function. The tertiary function of a key is specific to a particular mode of operation. While in that particular mode, pressing the function key initiates the tertiary function.

The 2075 front panel is designed so that where multiple keystrokes are required, the sequence is from left to right.

The keys of the numeric keypad are used for entry of numeric values. In all cases, the numeric entry is completed by pressing the **ENTER** key.

Table 3-1 lists the controls and indicators together with primary, secondary, and tertiary functions. The exact keystroke sequence for each function is also shown. Wherever functions or procedures are discussed in this manual, the applicable keystroke sequences are also included therein.

Table 3-1. Front Panel Controls and Indicators

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
1.	PRESET	Returns front panel control settings to preset values and stores current front panel control settings in memory register 0. Press: PRESET
2.	SPEC FUNC	Allows the entry of special function codes. To place the 2075 into any special function mode press: SPEC FUNC *numeric code* ENTER
		Allows viewing of the special function table to see which special functions are set to their default (.0) values or to some active state (.1, .2, .3, etc.). To enter the viewing mode, press: SPEC FUNC and use the **UP ARROW** and **DOWN ARROW** keys to move through the table.
		When already in this viewing mode, to change or enter a special function, enter the desired special function code by pressing: *numeric keys* ENTER This will also cause an exit from the viewing mode.
		To exit the special function table viewing mode without changing any settings, press: SPEC FUNC
3.	SHIFT	Initiates the shift function (secondary function) of the next key pressed. Press: SHIFT function key If the **SHIFT** key is pressed accidently, it can be deactivated by pressing it again.

Table 3-1. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
4.	LOCAL	Switches the 2075 from REMOTE to LOCAL mode except when local lockout is in effect. When in REMOTE press: LOCAL
		Allows the GPIB address of the 2075 to be displayed or a new address to be entered when in the LOCAL mode. When in the LOCAL mode press: LOCAL *numeric keys* ENTER
		Allows the GPIB address of an external local oscillator to be displayed or a new address to be entered. When in LOCAL mode only, press: SHIFT LOCAL *numeric keys* ENTER
5.	**FREQUENCY DISPLAY**	This LED display is also referred to as Window A. It displays the frequency, in MHz, of the function being performed. This display also has 8 annunciators. The 4 annunciators on the left refer to GPIB states. These are SRQ (service request), RMT (remote), TALK, and LISTEN. The four annunciators on the right are LO (local oscillator), IF (intermediate frequency), RF, and ENTER. A blinking ENTER annunciator signals the operator to enter a frequency value into an ENR table.
6.	ENR	Initiates the entry mode for ENR versus frequency values in the ENR versus frequency tables. Press this key once to initiate the entry mode. Press it again after all the entries have been made, to exit this mode. The lamp in the center of this key is lit while in the entry mode. Allows entry of the value for T_{hot} in kelvins. Press: SHIFT ENR
7.	ON/OFF	When operating in the manual measurement mode (normally used only with a true hot/cold thermal noise source), triggers a measurement. Press: ON/OFF
		Allows entry of the value for T_{cold}, in kelvins. Press: SHIFT ON/OFF *numeric keys* ENTER

Table 3-1. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
7.	ON/OFF (continued)	When Special Function 20.1 is in use, this key is used to display the ON voltage output from the Final Detector. If Special Function 20.2 is in use, pressing this key will display the OFF voltage output from the final detector. In either case, press: ON/OFF
8.	**NOISE DRIVE ON INDICATOR**	When operating in the manual measurement mode (normally used only with a true hot/cold thermal noise source), this lamp lights to tell the operator what measurement phase is being taken or has just been completed. **ON = hot, OFF = cold.** This indicator is not functional in the automatic measurement mode unless enabled by Special Function 21.1.
9.	**NOISE DRIVE CONNECTOR**	Supplies +28.00 volts DC drive voltage for a solid state calibrated noise source.
10.	**GAIN DISPLAY**	This display is also referred to as Window B. It displays Gain (G) or loss, ENR values, and temperature values entered by the user. Gain, loss, and ENR values may be displayed in dB or as ratios. Temperatures may be displayed as kelvins, degrees Centigrade, or degrees Fahrenheit. The eight annunciators in this display are LOSS, ENR, T(degrees F), T(degrees C), dB, RATIO, T(K), and ENTER. The ENTER annunciator blinks when the user is required to enter an ENR value.
11.	**ANALOG GAIN METER**	Is an analog indicator for Gain. The meter range is set by entering upper and lower meter limits for Gain. See items 35 and 36 of this table.
12.	RATIO/ dB	Changes the Window B unit of display for Gain or ENR from dB to a ratio or vice versa. An annunciator in the display shows which display unit is selected. Press: RATIO/ dB
13.	**NOISE FIGURE DISPLAY**	This display is also referred to as Window C. It displays Noise Figure, Y Factor, Effective Input Noise Temperature, Power Noise Measure, and Operating Noise Temperature. Noise Figure, Noise Measure, Y-Factor, and Power may be displayed as dB or as a ratio, depending on the unit of display selected. The eight annunciators in this display are F, Y, T_e(K), dB PWR, dB, RATIO, M, and T_{op}(K).

Table 3-1. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
14.	**ANALOG NOISE METER**	Is an analog indicator for noise figure. The meter range is set by entering upper and lower limits for the measurement desired. See items 35 and 36 of this table.
15.	RATIO/ dB	Changes the Window C unit of display from dB to a ratio or vice versa. An annunciator in the display indicates which is selected. Press: RATIO/ dB
16.	CALIB	Initiates an FCAL (frequency calibration) if Special Function 15.0 is enabled, and then a second stage calibration of the 2075. During second stage calibration the 2075 measures its own noise figures at different frequencies and stores these values for later use during corrected noise figure and gain measurements. Press: CALIB
		This key also is used to abort a calibration in progress. Press: CALIB
		Initiates a second stage calibration at the single fixed frequency to which the 2075 is currently tuned. Press: SHIFT CALIB
17.	**POWER ON/ OFF SWITCH**	Applies line voltage to the 2075 when the switch is set to ON.
18.	**SMOOTHING INDICATOR**	Shows the degree of smoothing currently in use. Each lit LED bar indicates a power of 2 increase in the smoothing factor. Smoothing factor is equal to the number of readings taken and averaged before the measurement is displayed when in the swept mode. Exponential smoothing is used during single frequency measurements.
19.	⇒	Adds smoothing in increments equal to powers of 2. Press or hold: ⇒

Table 3-1. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
20.	⇦	Subtracts smoothing in decrements equal to powers of 2. Press or hold: ⇦
21.	**RF INPUT CONNECTOR**	Is the 2075 input connector.
22.	F+G	Initiates measurement of corrected Noise Figure and Gain. Press: F+G *
		Initiates measurement of corrected T_e (Effective Noise Temperature) and Gain. Press: SHIFT F+G *
		*Requires prior Second Stage Calibration
23.	F	Initiates measurement of uncorrected Noise Figure. Press: F
		Initiates measurement of uncorrected T_e (Effective Noise Temperature) in kelvins. Press: SHIFT F
24.	**RELAY POWER ON INDICATOR**	This green lamp lights to indicate that the selected relay power voltage is present at the RELAY POWER OUTPUT CONNECTOR. This voltage is automatically turned on when the **CALIB** key is pressed.
25.	**RELAY POWER CONNECTOR**	This output connector provides a jumper selectable DC voltage of +5, +15, or +30 volts which may be used to actuate external relays. The external relays are used to bypass the DUT (Device Under Test) during Second Stage Calibration.

Table 3-1. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
26.	**DATA ENTRY KEYPAD 0-9, -, .**	Used to enter numeric data for various instrument functions. Digits keyed-in are displayed but do not become effective until the **ENTER** key is pressed. Press: *numeric data keys* ENTER
27.	CLEAR	Clears all numeric data which has been keyed-in but not yet terminated with the **ENTER** key. After the unwanted or erroneous numerics have been keyed-in, press: CLEAR
		When in the ENR versus Frequency entry mode, clears the Frequency/ENR pair currently displayed. Press: CLEAR
		When in the ENR versus Frequency entry mode, clears the table in use. Press: SHIFT CLEAR
28.	ENTER	Completes all numeric data entries. Numeric data which has been keyed-in does not take effect until this key has been pressed. Press: *numeric keys* ENTER
		When entering frequency and ENR values this key can be used to toggle the blinking ENTER annunciator back and forth between Window A and Window B. The ENTER annunciator indicates which value must be entered next, frequency or ENR. Press: ENTER
29.	SEQ	Causes sequential stepping through nine (1-9) of the ten front panel storage registers. The number of each register is displayed as it becomes available for access. These registers store front panel control settings for later recall and reuse. See paragraph 3-47. Press: SEQ ENTER

Table 3-1. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
29.	SEQ (continued)	Allows reprogramming of the stepping sequence through the 9 front panel storage registers. Key-in the entire new sequence before pressing the **ENTER** key. Press: SHIFT SEQ *numeric keys* ENTER
30.	STORE	Causes the current front panel control settings to be stored in 1 of the 9 front panel storage registers. Press: STORE *numeric key* ENTER
31.	RECALL	Causes a set of previously stored front panel control settings to be recalled from any of the 10 storage registers and made active. Press: RECALL *numeric key* ENTER
		Continues a sweep which was stopped in progress, from the point at which it was stopped. See item 39 of this table. Press: SHIFT RECALL
32.	FIXED FREQ	Allows entry of a fixed frequency to be used for a single frequency measurement. Press: FIXED FREQ *numeric keys* ENTER
		Allows entry of the frequency step size for manual frequency incrementing only. (If the frequency step size for automatic continuous sweeps or single sweeps is changed, using item 40 of this table, the manual frequency incrementing step size will automatically change to that same value.) SHIFT FIXED FREQ *numeric keys* ENTER
33.	⇧	Causes frequency to step upward when in the fixed frequency mode. Also causes frequency to increment when viewing Frequency versus ENR tables. Press or hold: ⇧

Table 3-1. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
33.	⇧ (continued)	Causes incrementing through the special functions table when in the special functions viewing mode. See item 2 of this table. Press or hold: ⇧
		Allows entry of a signal amplitude (in dBm only) for an external local oscillator. Press: SHIFT ⇧ *numeric keys* ENTER
34.	⇩	Causes frequency to step downward when in the fixed frequency mode. Also causes frequency to decrement when viewing the Frequency versus ENR tables. Press or hold: ⇩
		Causes decrementing through the special functions table when in the special functions viewing mode. Press or hold: ⇩
		Allows entry of the Second Local Oscillator frequency used in DUT (Device Under Test) Configuration 6. Press: SHIFT ⇩ *numeric keys* ENTER
35.	UPPER LIMIT	Allows entry of the upper limit for Window C measurements. The minimum upper limit allowed is -30 and the maximum upper limit allowed is 9999. The value entered is used by the 2075 only to set the range of the ANALOG NOISE METER and to set the range for the SCOPE/PLOTTER OUTPUT. Press: UPPER LIMIT *numeric keys* ENTER

Table 3-1. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
35.	UPPER LIMIT (continued)	Allows entry of the upper limit for Gain. The maximum allowable upper limit is 80 dB and the minimum allowable upper limit is -30 dB. This value is used by the 2075 to set the ranges for the ANALOG GAIN METER and the SCOPE/PLOTTER OUTPUT. Press: SHIFT UPPER LIMIT *numeric keys* ENTER
36.	LOWER LIMIT	Allows entry of the lower limit for measurements displayed in Window C. The minimum allowable lower limit is -30. The maximum allowable lower limit is 9999. The value entered is used by the 2075 only to set the range of the ANALOG NOISE METER and to set the range for the SCOPE/PLOTTER OUTPUT. Press: LOWER LIMIT *numeric keys* ENTER
		Allows entry of the lower limit for Gain. The minimum allowable lower limit is -30 dB. The maximum allowable lower limit is 80 dB. The value entered is used by the 2075 only to set the ranges for the ANALOG GAIN METER and the SCOPE/PLOTTER OUTPUT. Press: SHIFT LOWER LIMIT *numeric keys* ENTER
37.	START FREQ	Allows entry of the start frequency for frequency sweeps. Press: START *numeric keys* ENTER
		Causes the 2075 to tune to the current start frequency value. The previous value for fixed frequency is lost and replaced with this current start frequency value. Press: START FREQ
		Allows entry of the IF frequency from the external mixer when external downconversion is required in test configurations 2, 4, and 6. The IF frequency is the input frequency to the 2075. Press: SHIFT START FREQ *numeric keys* ENTER

Table 3-1. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
38.	STOP FREQ	Allows entry of the stop frequency for frequency sweeps. Press: STOP FREQ *numeric keys* ENTER
		Causes the 2075 to tune to the current value for stop frequency. The previous value for fixed frequency is lost and replaced with this current stop frequency value. Press: STOP FREQ
		Allows entry of a fixed Local Oscillator frequency when external downconversion is required (DUT Test Configurations 2-6). Press: SHIFT STOP FREQ *numeric keys* ENTER
39.	SWEEP	Initiates continuous automatic sweeps from start frequency to stop frequency. Each sweep is composed of incremental frequency steps across the band. Press: SWEEP
		Stops a sweep in progress and leaves the 2075 tuned to the frequency at which the sweep was stopped. See item 31 in this table. Press: SWEEP
		Initiates a single sweep from the start frequency to the stop frequency. Press: SHIFT SWEEP
40.	STEP SIZE	Allows entry of the incremental frequency step size for automatic continuous or single sweeps (.1 MHz minimum). Entering this value will also change the step size for manual frequency incrementing or decrementing. Press: STEP SIZE *numeric keys* ENTER

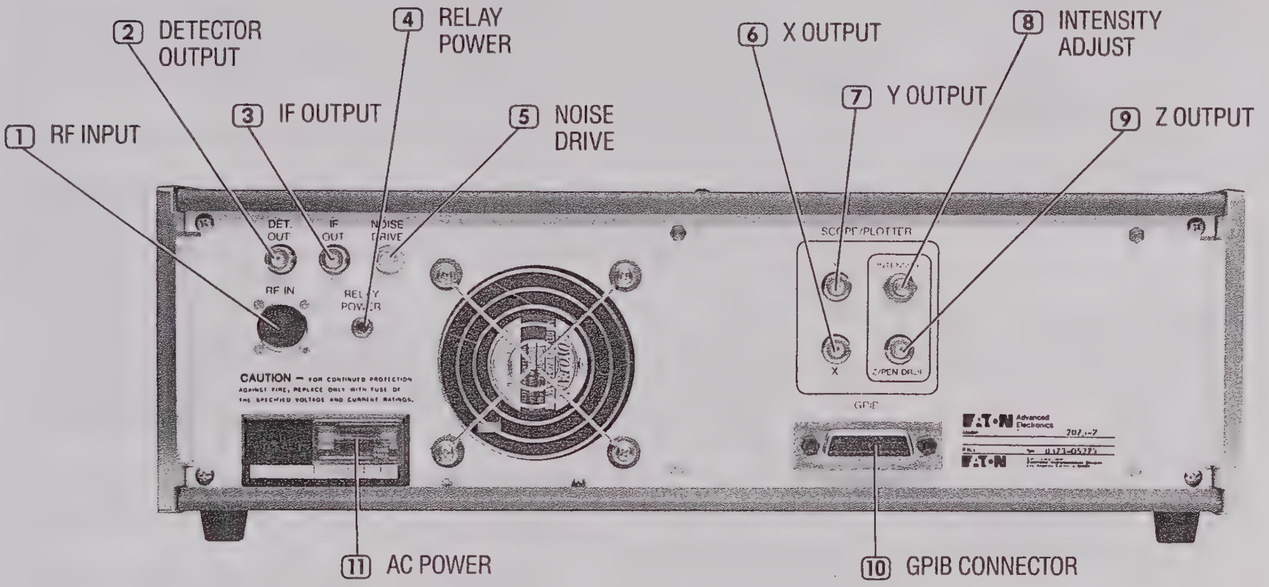

1 RF INPUT
2 DETECTOR OUTPUT
3 IF OUTPUT
4 RELAY POWER
5 NOISE DRIVE
6 X OUTPUT
7 Y OUTPUT
8 INTENSITY ADJUST
9 Z OUTPUT
10 GPIB CONNECTOR
11 AC POWER
DET. OUT
IF OUT
NOISE DRIVE
RF IN
RELAY POWER
CAUTION —
SCOPE/PLOTTER
X
Z/PEN DRIVE
GPIB

Figure 3-2. 2075 REAR PANEL

Table 3-2. Rear Panel Controls and Indicators

ITEM	DESIGNATION	FUNCTION
1.	**RF INPUT CONNECTOR**	This RF INPUT connector on the rear panel is optional when ordering the 2075. It is also possible to remove the front panel RF INPUT connector and install it on the rear panel. The internal semi-rigid coaxial cable can be reshaped to make the necessary connection.
2.	**DET OUT**	This BNC connector is the test output for the Final Detector output voltage.
3.	**IF OUT**	This BNC connector is the test output for the 30 MHz signal which is the result of the second stage of internal downconversion in the 2075.
4.	**RELAY POWER CONNECTOR**	This output connector provides a jumper selectable DC voltage of +5, +15, or +30 volts which may be used to actuate external relays. The external relays are used to bypass the DUT during Second Stage Calibration. This connector parallels the RELAY POWER connector on the front panel.

Table 3-2. Rear Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTION
5.	**NOISE DRIVE CONNECTOR**	Supplies +28.00 volts DC for the solid state calibrated noise source. Parallels the NOISE DRIVE connector on the front panel.
6.	**X OUTPUT**	This BNC connector is the output for the horizontal drive signal to the scope/plotter X axis. The X axis drives for both gain and noise figure traces are output alternately. The sawtooth waveform minimum and maximum voltages are 0 and 6 volts respectively.
7.	**Y OUTPUT**	This BNC connector is the output for the scope/plotter Y axis. The Y axis drives for both gain and noise data are output singly or alternately depending on the setting of Special Function 7. The minimum and maximum voltages are 0 and 6 volts respectively.
8.	**INTENSITY ADJUST**	This adjustment controls the brightness of the gain and noise figure traces on the oscilloscope.
9.	**Z OUTPUT**	This BNC connector is the output for the scope/plotter Z axis. This positive going signal blanks the oscilloscope during retrace or activates the pen lift on the plotter. It also decreases the intensity for the gain trace. When both gain and noise figure are being displayed on an oscilloscope, the noise trace is the brighter one. The signal minimum and maximum voltages are 0 and 5 volts.
10.	**GPIB**	This 24 pin connector is the input/output connector for the General Purpose Interface Bus (IEEE-488). Pin numbers are illustrated in Figure 2-5.
11.	**AC POWER**	This is the receptacle for the AC power cord, the holder for the AC fuse, and the receptacle for the AC voltage selector card.

3-4. POWER-ON CONDITIONS, PRESET, AND TOTAL SYSTEM RESET

Power-On Conditions

When the 2075 is powered-on, it automatically performs a series of self-tests. These check the operation of the Math Processor, RAM's, ROM's, GPIB Controller Chip, the Direct Memory Access Controller (DMAC), and the Scope/Plotter Output Interface. Finally, the instrument performs a Frequency Calibration (FCAL) which ensures the accuracy of its frequency tuning. Immediately after placing the POWER switch in the ON position, the following correct indications will be observed:

1. All front panel red LED's and indicators light briefly.
2. The words SELF TEST appear in Windows A and B while the numbers 1 through 6 appear sequentially in Window C.
3. The message FCAL appears briefly in Window B.

When the frequency calibration is completed, the instrument restores the frequency and control parameters it had before it was last powered-off, except for the following:

The instrument is in LOCAL mode.

The instrument is in Fixed Frequency Mode and is tuned to the last frequency set prior to power-down.

The measurement mode is Uncorrected (Cascade) Noise Figure.

The instrument is in the Continuous Measurement Mode (it is continuously making measurements).

Previous Second Stage Calibration data is lost.

The SRQ (Service Request) function is disabled.

Some special functions are restored to their previous values and others revert to their default or .0 state. For a complete listing of power-on control parameters see Column 2 of Table 3-3.

Preset

The **PRESET** key can be pressed at any time to restore certain of the control parameters to known preset values. This feature is typically used after a power-on or when previous control parameters are unknown. Some parameters and special functions are not affected by the PRESET function and will remain in their previous states. See Column 3 of Table 3-3 for a complete list of PRESET parameter values.

Total System Reset

This is a special function which erases all previous frequency and control parameters including ENR tables. After the parameters are erased, some are automatically replaced with values from ROM. This special function is typically used as a security measure after confidential measurements have been made. It should also be performed after the 2075 has been unused for a long enough period of time that the data in battery backed-up RAM may be unreliable. To do a Total System Reset press:

SPEC FUNC 0.9 ENTER

After the system reset, an IF Attenuator Calibration (Special Function 19.1) must be performed. See paragraph 3-36, page 3-78.

Column 4 of Table 3-3 shows what control parameter values are in effect after the total system reset is performed.

Column 5 of Table 3-3 shows which control parameters can be stored in the STORE-RECALL registers (paragraph 3-48, page 3-110).

Table 3-3. Power-On, Preset, and Total System Reset Parameters

This is a listing of all the control parameters and special functions settings which are in effect after a Power-up, Preset, or Total System Reset via Special Function 0.9. The last column shows which control parameters can be stored in the Store-Recall registers.

PARAMETER	POWER ON	PRESET or DEVICE CLEAR	TOTAL SYSTEM RESET (SP FN 0.9)	STORABLE IN REGISTERS
INPUT PARAMETERS				
Tuned Frequency	N.C.	30 MHz	30 MHz	YES
Start Frequency	N.C.	10 MHz	10 MHz	YES
Stop Frequency	N.C.	1900 MHz	1900 MHz	YES
Swept Frequency Step Size	N.C.	20 MHz	20 MHz	YES
Fixed Frequency Step Size	N.C.	20 MHz	20 MHz	YES
Fixed Frequency Step Size	N.C.	20 MHz	20 MHz	YES
Ext LO 1 Frequency	N.C.	1000 MNz	1000 MHz	YES
Ext LO 2 Frequency	N.C.	1000 MHz	1000 MHz	YES
Int IF Frequency	N.C.	30 MHz	20 MHz	YES
LO Settling Time	N.C.	N.C.	100 msec	
LO Power Level	N.C.	0 dBm	0 dBm	YES
RF Frequency	N.C.	N.C.	10 MHz	
RF Start Frequency	N.C.	N.C.	10 MHz	
RF Stop Frequency	N.C.	N.C.	1900 MHz	
RF Sweep Delta	N.C.	N.C.	20 MHz	
RF Step Size	N.C.	N.C.	20 MHz	
SCOPE/PLOTTER PARAMETERS:				
Noise Upper Limit	30	30	30	YES
Noise Lower Limit	0	0	0	YES
Gain Upper Limit	80 dB	80 dB	80 dB	YES
Gain Lower Limit	-20 dB	-20 dB	-20 dB	YES
LOSS COMPENSATION PARAMETERS:				
Loss Before DUT	0 dB	0 dB	0 dB	
Loss After DUT	0 dB	0 dB	0 dB	
Temperature of Losses	290 k	290 k	290 k	
BANDWIDTH COMPENSATION PARAMETERS:				
Bandwidth 1	5 MHz	5 MHz	5 MHz	
Bandwidth 2	5 MHz	5 MHz	5 MHz	
ENR Table Selection (sp fn 5)	N.C.	N.C.	TABLE 0	
ENR Tables	N.C.	N.C.	CLEAR ALL	
Nom ENR Value	N.C.	N.C.	15.5 dB	
T_{Hot} Entry	9893 k	N.C.	9893 k	YES
T_{Cold} Entry	296.0 k	N.C.	296.0 k	

N.C. = no change from previous set value

Table 3-3. Power-On, Preset, and Total System Reset Parameters (Continued)

PARAMETER	POWER ON	PRESET or DEVICE CLEAR	TOTAL SYSTEM RESET (SP FN 0.9)	STORABLE IN REGISTERS
BANDWIDTH COMPENSATION PARAMETERS (Continued):				
IF Calibration Data	SAVED	SAVED	CLEARED	
Second Stage Calibration Data	CLEARED	CLEARED	CLEARED	
Store/Recall Registers	SAVED	SAVED (and the current front panel is saved in register 0)	CLEARED	
Set Sequence	SAVED	SAVED	CLEARED	
SPECIAL FUNCTIONS:				
1	N.C.	1.1	1.1	YES
2	N.C.	2.0	2.0	YES
3	N.C.	3.0	3.0	
4	4.0	4.0	4.0	
5	N.C.	N.C.	5.0	YES
6	6.0	6.0	6.0	
7	(7.2 OR 7.6)		7.2	
8	8.0	8.0	8.0	
9	N.C.	9.0	9.0	
10	10.0	10.0	10.0	
11	11.1*	11.0	11.0	
12	N.C.	12.0	12.0	
13	13.1*	13.0	13.0	
14	14.0	14.0	14.0	
15	15.0	15.0	15.0	
16	16.1	16.1	16.1	
17	17.0	17.0	17.0	
18	18.0	18.0	18.0	
19	19.0	19.0	19.0	
20	20.0	20.0	20.0	
21	21.0	21.0	21.0	
22	22.0	22.0	22.0	
23	23.0	23.0	23.0	
24	N.C.	24.0	24.0	
30	30.0	30.0	30.0	
31	31.0	31.0	31.0	
32	32.0	32.0	32.0	
33	33.0	33.0	33.0	

* = is set to this value but is not active

Table 3-3. Power-On, Preset, and Total System Reset Parameters (Continued)

PARAMETER	POWER ON	PRESET or DEVICE CLEAR	TOTAL SYSTEM RESET (SP FN 0.9)	STORABLE IN REGISTERS
SPECIAL FUNCTIONS (Continued):				
34	34.0	34.0	34.0	
35	35.0	35.0	35.0	
36	36.0	36.0	36.0	
37	37.0	37.0	37.0	
38	38.0	38.0	38.0	
39	39.0	39.0	39.0	
40	40.0	40.0	40.0	YES
42	42.0	42.0	42.0	
43	43.0	43.0	43.0	
44	44.0	44.0	44.0	
45	45.0	45.0	45.0	
46	46.0	46.0	46.0	
47	N.C.	N.C.	47.0	YES
48	48.0	48.0	48.0	
49	N.C.	49.0	49.0	

* = is set to this value but is not active

3-5. CONTINUOUS MEASUREMENT MODE AND THE HOLD FUNCTION

After the 2075 completes its power-on sequence, it goes into the Continuous Measurement Mode which is its normal mode. While in this mode, fixed frequency measurements are made at a maximum rate of 11 times per second, at the current tuned frequency.

While the user enters the various control and frequency parameters prior to making the desired measurement, the instrument will continue to make measurements in this continuous mode. Thus, measurements will be made before a complete and consistent set of parameters can be entered by the user. This may result in error messages.

A HOLD function is provided which takes the instrument out of continuous measurement mode and prevents this situation. This is a special function. To activate HOLD press:

SPEC FUNC 14.1 ENTER

GPIB: T1

After all the control and frequency parameters have been entered the HOLD function should be deactivated. To deactivate HOLD and restore the instrument to continuous measurement mode, press:

SPEC FUNC 14.0 ENTER

GPIB: T0

3-6. FIXED FREQUENCY OPERATION

In the Fixed Frequency Mode the 2075 makes measurements at a single frequency. The instrument is in this mode after power-on until a Swept Frequency Mode is selected by the user.

Fixed Frequency Value

The **FIXED FREQ** key is used to display the current fixed frequency or to enter a new fixed frequency value. Entering a fixed frequency value tunes the 2075 to that frequency. In Test Configurations 1 and 4, the allowable frequency entries are 10 MHz to 1900 MHz. In Test Configurations 2, 3, 5, and 6, the allowable entries are 10 MHz to 65.535 GHz.

To enter a Fixed Frequency value (for example, 1600 MHz) press:

[FIXED FREQ] [1600] [ENTER]

GPIB: FF1600MZ

Fixed Frequency Step Size

In the Fixed Frequency Mode a Fixed Frequency Step Size may be entered and then used for manual tuning in step size increments.

In Test Configuration 1 the smallest entry allowed is .1 MHz and the largest is 1800 MHz. An entry resolution of .1 MHz is allowed only in Test Configuration 1.

In Test Configurations 2 through 6, the smallest entry allowed is 1 MHz and the largest is 1800 MHz. In these test configurations, always enter an integer value of MHz. If a fractional value is entered, the 2075 will automatically round it off to the nearest whole number in MHz, unless Special Function 9.1 is activated. Also, if an entry is made which is too small or too large, the instrument will automatically force that entry to the smallest or largest allowable value, whichever applies.

To enter a Fixed Frequency Step Size (for example, 50 MHz) press:

[SHIFT] [FIXED FREQ] [50] [ENTER]

Note that this procedure is different from the procedure for entering the frequency step size for swept measurements. Also, note that whenever a Swept Frequency Step Size is entered, it replaces the Fixed Frequency Step Size. See items 32 and 40 of Table 3-1, pages 3-11 and 3-14.

Manual Tuning

The frequency to which the 2075 is tuned may be changed by entering a new fixed frequency or by pressing the **UP ARROW** or **DOWN ARROW** keys. These keys move the tuning up or down in increments equal to the Fixed Frequency Step Size.

For example, if the instrument is currently tuned to 1600 MHz and a fixed frequency step size of 50 MHz has been entered, pressing the UP ARROW key once will tune the instrument to 1650 MHz. Pressing the **UP ARROW** key again will tune it to 1700 MHz. Holding the **UP ARROW** or **DOWN ARROW** key will cause continuous incrementing or decrementing. Manual tuning changes the stored value for fixed frequency by setting it equal to the new tuned frequency.

The frequency display will not display fractional frequency values (allowed only in Test Configuration 1) unless Special Function 9.1 is enabled (display 100 KHz resolution).

If the instrument is in the corrected measurement mode (a Second Stage Calibration must already have been performed) when it is tuned to a frequency point for which calibration data has not been taken, error message 110 will appear. The message indicates that measurement is being made at an uncalibrated point. This error can be avoided by pressing the **F** key to place the instrument in the uncorrected (cascade) measurement mode before tuning manually. It can also be avoided by activating Special Function 24.1 which causes calibration data to be interpolated for uncalibrated frequency points.

To perform a second stage calibration in the Fixed Frequency Mode, first tune to the desired frequency and then press:

SHIFT CALIB

The 2075 takes calibration data only for that frequency.

3-7. SWEPT FREQUENCY OPERATION

In Swept Frequency Mode, the 2075 steps from a Start Frequency to a Stop Frequency in discrete increments which are determined by the Swept Frequency Step Size. Measurements are made at the Start Frequency, at each step, and at the Stop Frequency.

In Test Configuration 1 the allowable maximum sweep range is from 10 MHz to 1900 MHz. The minimum step size allowed is .1 MHz.

In Test Configurations 2 through 6, the allowable maximum sweep range is from 10 MHz to 65.535 GHz. The minimum step size allowed is 1 MHz. These limitations are modified, in practice, by the frequency parameters of the external local oscillator, the external mixer, and the noise source in use.

To enter the Start Frequency (for example, 50 MHz) press:

START FREQ 50 ENTER

To enter the Stop Frequency (for example, 1700 MHz) press:

STOP FREQ 1700 ENTER

To enter the Swept Frequency Step Size (for example, 25 MHz) press:

STEP SIZE 25 ENTER

It should be noted that entry of a Swept Frequency Step Size also changes the Fixed Frequency Step Size to the value entered.

Two swept frequency modes are available: Single Sweep and Continuous Automatic Sweeps.

To select Single Sweep Mode and initiate a single swept measurement, press:

SHIFT SWEEP

The 2075 executes a single sweep and then remains tuned to the Stop Frequency.

To select Continuous Automatic Sweeps, press:

SWEEP

The 2075 begins sweeping continuously.

To interrupt a single sweep or continuous sweeps, press:

SWEEP

The instrument stops and remains tuned to the last frequency point measured just before the key was pressed.

To continue the sweep from the point where it was stopped, press:

SHIFT RECALL

Or, to restart the sweep beginning at the Start Frequency, press:

SWEEP or SHIFT SWEEP

If the final increment (Step Size) of a sweep would cause the sweep to go past the programmed Stop Frequency, the instrument tunes only a partial increment and ends that sweep at the Stop Frequency. It should be noted that the partial increment will appear as a full increment if displayed on an oscilloscope.

The Start Frequency, Step Size, and Stop Frequency values also determine the frequency points at which second stage calibration is performed. A maximum of 100 calibration points can be taken. To perform a swept frequency Second Stage Calibration, press:

CALIB

For more information on Second Stage Calibration, see paragraph 3-34, page 3-75.

After power-on, the 2075 is in the Fixed Frequency Mode until a swept mode is selected.

3-8. UNCORRECTED AND CORRECTED MEASUREMENTS

The 2075 allows the user to make any type of measurement and then easily go from one type to another. Figure 3-3 illustrates the relationship between the uncorrected (cascade) and corrected (first stage) measurement modes and shows what measurements can be made in each. The intent here is to show the user:

a. how to switch back and forth from the corrected to the uncorrected mode, and

b. how to make each type of measurement in either mode.

This is not a detailed procedure but is merely intended to give the user an overview of the basic modes and measurement types. Detailed procedures, specific to each test configuration, are given in paragraphs 3-11 through 3-18.

Before any measurements are made, these initial steps must be performed:

1. ENR values (noise source calibration data) must be entered into an ENR table. (Paragraph 3-9)

2. The correct test configuration must be selected. (Paragraph 3-10)

3. All frequency parameters must be entered. After this step the instrument is in the uncorrected (cascade) measurement mode and any uncorrected measurement can now be made. Uncorrected Noise Figure (F) is the default measurement if none is selected.

4. Perform a Second Stage Calibration. After this step the instrument is automatically in the corrected (first stage) measurement mode and any corrected measurement can be made. This step is not required unless corrected measurements are desired. Corrected Noise Figure and Gain (F+G) is the default measurement if none is selected.

The left branch of the diagram shows the choices for uncorrected measurements. The right branch shows the choices for corrected measurements. When in the left branch or the right branch, any of the measurements shown in that branch can be made in any sequence.

Pressing the **F** key changes the mode from the right branch to the left branch (corrected mode to uncorrected mode). Conversely, pressing the **F+G** key changes from the left branch back to the right branch, but only if Second Stage Calibration has been performed. Otherwise perform Step 4 to go from the left branch to the right branch.

Note that no Second Stage Calibration is necessary before making uncorrected measurements. Second Stage Calibration is always necessary before making corrected measurements.

It should be noted that after the keystroke sequence has been entered to choose a particular measurement, it is necessary to select either single sweep (**SHIFT SWEEP**) or continuous automatic sweeps (**SWEEP**) to execute the swept measurement.

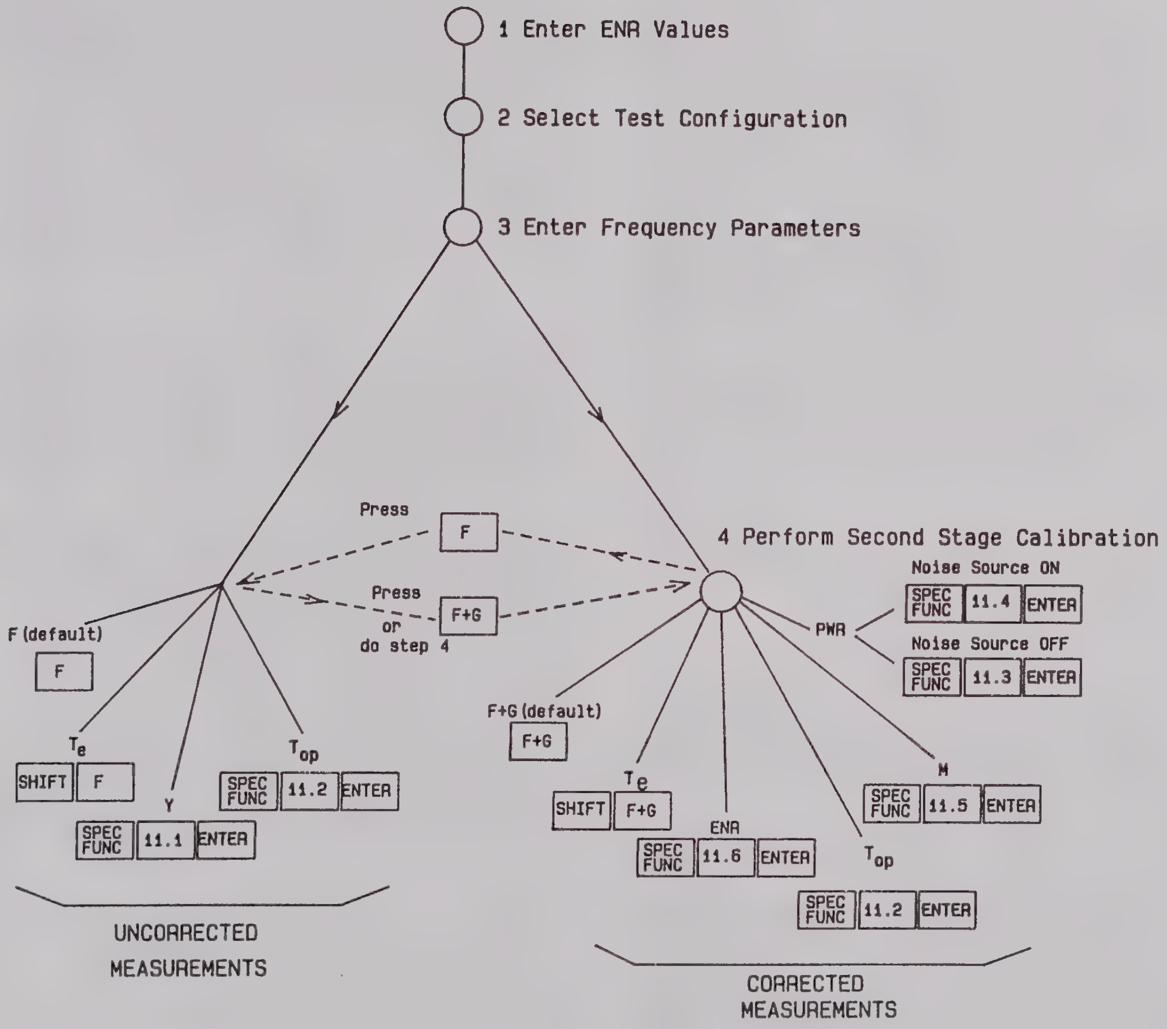

1 Enter ENR Values
2 Select Test Configuration
3 Enter Frequency Parameters
Press
F
4 Perform Second Stage Calibration
Noise Source ON
SPEC FUNC
11.4
ENTER
Press
F+G
or
do step 4
PWR
Noise Source OFF
SPEC FUNC
11.3
ENTER
F (default)
F
F+G (default)
F+G
Te
SHIFT
F
Y
Top
SPEC FUNC
11.2
ENTER
SPEC FUNC
11.1
ENTER
Te
SHIFT
F+G
ENR
SPEC FUNC
11.6
ENTER
M
SPEC FUNC
11.5
ENTER
Top
SPEC FUNC
11.2
ENTER
UNCORRECTED MEASUREMENTS
CORRECTED MEASUREMENTS

Figure 3-3. UNCORRECTED AND CORRECTED MEASUREMENTS

3-9. ENTRY OF FREQUENCY AND ENR VALUES

After the 2075 has been installed, the first procedure that must be performed prior to operation is the entry of paired frequency and ENR values into the ENR storage table. Tables 1, 2, and 3 each allow entry of up to 31 sets of values. Thus, frequency and ENR values may be stored for as many as 3 separate noise sources. Table 0 can store only one ENR value and uses it for all frequencies. Table 0 generally is used either for fixed frequency measurements, or for swept measurements when the desired accuracy is less than the positive and negative deviations from the nominal ENR value across the frequency range of interest.

Although frequency and ENR values should have been entered into Table 1 during the Second Stage Calibration Procedure (part of the Performance Verification Procedures of Section 5), the procedure below should be performed to insure that the values in the table are those for the noise source which will be used while taking measurements. Measurements cannot be made unless ENR values have been entered.

Perform the following steps:

1. Select the noise source which will be used to make the measurements.
2. Apply AC power to the 2075.
3. Allow several seconds for the 2075 to complete its automatic power-up self-tests. These are completed when the message FCAL has appeared in, and then disappeared from, Window B.
4. Press the **PRESET** key. Wait until the new FCAL message disappears from Window B, signifying that the frequency calibration is completed. PRESET restores the control parameters to a set of known values.
5. Press: SPEC FUNC 5.1 ENTER

   This calls up, or activates, Table 1. The data about to be entered will be stored in Table 1 (5.2 would have called up Table 2 and 5.3 would have called up Table 3). The error message 104 may appear indicating that no data is currently stored. If so, it may be disregarded.
6. Press: ENR GPIB: EN

   This places the 2075 in the mode which allows entry of the frequencies and ENR values. The red light in the center of the ENR key is illuminated. Also, the ENTER annunciator in Window A begins to blink, signifying that the operator is required to enter a frequency.
7. Enter the first calibration frequency, in MHz, from the noise source calibration data sheet (for example, 10 MHz) by pressing:

   10 ENTER

   The frequency just entered appears in Window A. The ENTER annunciator in Window B begins to blink signifying that the operator is required to enter the ENR value, in dB, for the frequency just entered.
8. Read the ENR value for the frequency just entered, from the noise source calibration data sheet, or the inscribed label on the calibrated noise source. Enter this value by pressing:

   numeric keys ENTER

   The value just entered appears in Window B. This completes the entries for the first frequency. The ENTER annunciator in Window A begins to blink, indicating that the next frequency should be entered.
9. Enter the next frequency, in MHz, from the noise source calibration data sheet by pressing:

   numeric keys ENTER

   The frequency just entered appears in Window A. The ENTER annunciator in Window B begins to blink, signifying that the ENR value for that frequency should now be entered. ENR values are always entered in decibels.

10. Enter the ENR value by pressing:

    numeric keys ENTER

    The value just entered appears in Window B. Now the ENTER annunciator in Window A will start to blink again, indicating that the next frequency should be entered.

11. Continue to enter paired frequency and ENR values for all data points shown on the noise source calibration data sheet. The frequency range of the entries must equal or exceed the range over which measurements will be made. That is, measurements cannot be made at RF frequencies which are outside the lowest and highest frequencies of ENR entries. Up to 31 frequency and ENR value pairs may be entered into each of Tables 1, 2, and 3.

12. After all the entries have been made, use the **DOWN ARROW** and **UP ARROW** keys to examine the entries for correctness. Step down through the table by pressing or holding the **DOWN ARROW** key. Step up through the table by pressing or holding the **UP ARROW** key.

    To clear an erroneous entry, first display it using the **UP** or **DOWN ARROW** keys and then press the **CLEAR** key. Both the frequency and the ENR value will be cleared. Then enter the correct value. The **ENTER** key can be used to toggle the ENTER annunciator back and forth between Window A and Window B. See paragraph 3-31 for more information. To clear the entire table, press:

    SHIFT CLEAR

13. Press: ENR GPIB: EN

    This takes the 2075 out of the ENR table entry and display mode. The red light in the center of the **ENR** key will go out.

14. This completes the entry of ENR data. Because Table 1 was selected (by Special Function 5.1) to store the data, Table 1 will automatically be used by the 2075 when measurements are made. Table 1 will continue to be used until some other table is selected by entering Special Function 5.2, 5.3, 5.4, or 5.0. For more detailed information on use of ENR Tables, see paragraph 3-31.

15. Go to paragraph 3-10 on page 3-27 to select the correct test configuration for the device to be tested.

3-10. SELECTING THE CORRECT TEST CONFIGURATION

The 2075 may be used in any of 6 different test configurations. Generally, the type of Device Under Test and its output frequencies determine which test configuration must be used. Additional considerations are the width of the RF frequency range of the desired measurement, and availability of GPIB compatible local oscillators.

For the purpose of choosing the correct test configuration, consider that there are two basic types of DUT's. These two types may loosely be categorized as amplifier devices or receiver devices. These are defined below:

AMPLIFIER:	Any linear device whose input and output frequencies are the same. This category includes amplifiers, filters, attenuators, isolators, PIN switches, etc.
RECEIVER:	Any linear device (linear in terms of input and output power) whose input and output frequencies are different. This category includes receivers, tuners, mixers, etc.

When the DUT is an amplifier with an output frequency higher than 1850 MHz, external downconversion is required to produce an IF frequency below 1850 MHz. This IF is then input to the 2075. The 2075 has the capability to control the frequency and power of the external local oscillator used in this process (provided that it is GPIB compatible).

The frequency of the local oscillator can be varied by the 2075 to produce a fixed IF (Test Configuration 2). This method is used where the measurement is to be made over a relatively wide RF frequency range. For example, the swept measurement can be made across the RF band from 5 GHz to 10 GHz and converted to a single, fixed frequency IF below 1850 MHz.

The frequency of the local oscillator can remain fixed to produce a variable frequency IF from the mixer (Test Configuration 3). This IF must not vary over a range greater than 1850 MHz or it will exceed the input frequency range of the 2075. This method can be used when the swept measurement is taken across a relatively narrow RF frequency band. In this application the local oscillator need not be GPIB compatible.

Where the DUT is a receiver device such as a mixer, the 2075 can control the frequency and power of the external local oscillator which drives the DUT. Again, the local oscillator frequency can be automatically varied to give a fixed IF output from the DUT, useful for measurement over a wide RF range (Test Configuration 4).

For narrow band measurements, the local oscillator frequency can remain fixed to give a variable IF output (Test Configuration 5).

In cases where the DUT is a receiver having an IF output frequency higher than 1850 MHz, a second stage of external downconversion is required (Test Configuration 6). Here, a fixed frequency local oscillator drives the DUT, giving a variable frequency IF. This variable IF is applied to a second mixer. The local oscillator driving the second mixer is tuned by the 2075 via the IEEE-488 Interface Bus, to give a fixed frequency IF.

Table 3-4 is used to select the correct test configuration for the device to be tested. Read the table from left to right to select the correct test configuration. Then go to the paragraph listed in Column 4 to find the test procedure for that test configuration. Although there are 6 basic test configurations available, 8 possible choices are shown. This is because Configurations 2 and 4 may be used for double sideband or single sideband measurements.

Column 1 shows the two basic types of devices which may be tested. An amplifier device is tested using Configuration 1, 2, or 3. A receiver device is tested using Configuration 4, 5, or 6.

Column 2 shows how the output frequency of the DUT affects the choice of test configuration. For an amplifier device with an output frequency below 1850 MHz, Test Configuration 1 is used. For an amplifier device with an output frequency above 1850 MHz, Test Configuration 2 or 3 is used.

For a receiver device with an IF output frequency below 1850 MHz, Test Configuration 4 or 5 is used. For a receiver device with an IF output frequency above 1850 MHz, Test Configuration 6 is used.

Column 3 shows how the width of the RF measurement range affects the choice of test configuration. Generally, if the measurements are to be taken across an RF range more than 1.6 GHz in width, Configuration 2 or 4 is used because these will support double sideband measurements. A detailed explanation of why single sideband measurements cannot be made over an RF range wider than 1.6 GHz is given in paragraph 3-37.

Column 4 shows which test configuration is required for a device which meets the conditions of Columns 1, 2, and 3, and directs the user to the paragraphs containing that procedure.

Column 5 lists additional information regarding each test configuration.

The selection process as shown in Table 3-4 is not completely inflexible. It is a guide for the new user and will hold true for most applications. The experienced user, however, will find some exceptions. More information is given at the beginning of the procedure for each test configuration.

Figure 3-4 shows, for each test configuration, whether the external local oscillator frequency is fixed or variable, and whether the IF is variable or fixed.

Table 3-4. Selecting the Test Configuration

TYPE OF DEVICE UNDER TEST	OUTPUT FREQUENCY OF DEVICE	WIDTH OF RF MEASUREMENT RANGE PARAGRAPH	TEST CONFIGURATION AND PROCEDURE	COMMENTS
AMPLIFIER	< 1850 MHz	LESS THAN 1840 MHz WIDE	1 (SPEC FUNC 1.1) GO TO PARA. 3-11	No external downconversion is used. Select no sideband.
	> 1850 MHz	MORE THAN 1.6 GHz WIDE	2 (SPEC FUNC 1.2) GO TO PARA. 3-12	Swept LO, Fixed IF. GPIB compatible local oscillator is required. Select Double Sideband.
		LESS THAN 1.6 GHz WIDE	2 (SPEC FUNC 1.2) GO TO PARA. 3-13	Swept LO, Fixed IF. GPIB compatible local oscillator is required. Select Single Sideband.
			3 (SPEC FUND 1.3) GO TO PARA. 3-14	Fixed LO, Swept IF. Local oscillator need not be GPIB compatible. Select Single Sideband.
RECEIVER	< 1850 MHz (IF)	MORE THAN 1.6 GHz WIDE	4 (SPEC FUNC 1.4) GO TO PARA. 3-15	Swept LO, Fixed IF. GPIB compatible local oscillator is required. Select Double Sideband.
		LESS THAN 1.6 GHz WIDE	4 (SPEC FUNC 1.4) GO TO PARA. 3-16	Swept LO, Fixed IF. GPIB compatible local oscillator is required. Select Single Sideband.
			5 (SPEC FUNC 1.5) GO TO PARA. 3-17	Fixed LO, Swept IF. External local oscillator need not be GPIB compatible. Select Single Side-Band.
	> 1850 MHz (IF)		6 (SPEC FUNC 1.6) GO TO PARA. 3-18	The DUT is driven by a fixed frequency local oscillator. The external mixer is driven by a variable frequency local oscillator which must be GPIB compatible. Select Single Sideband.

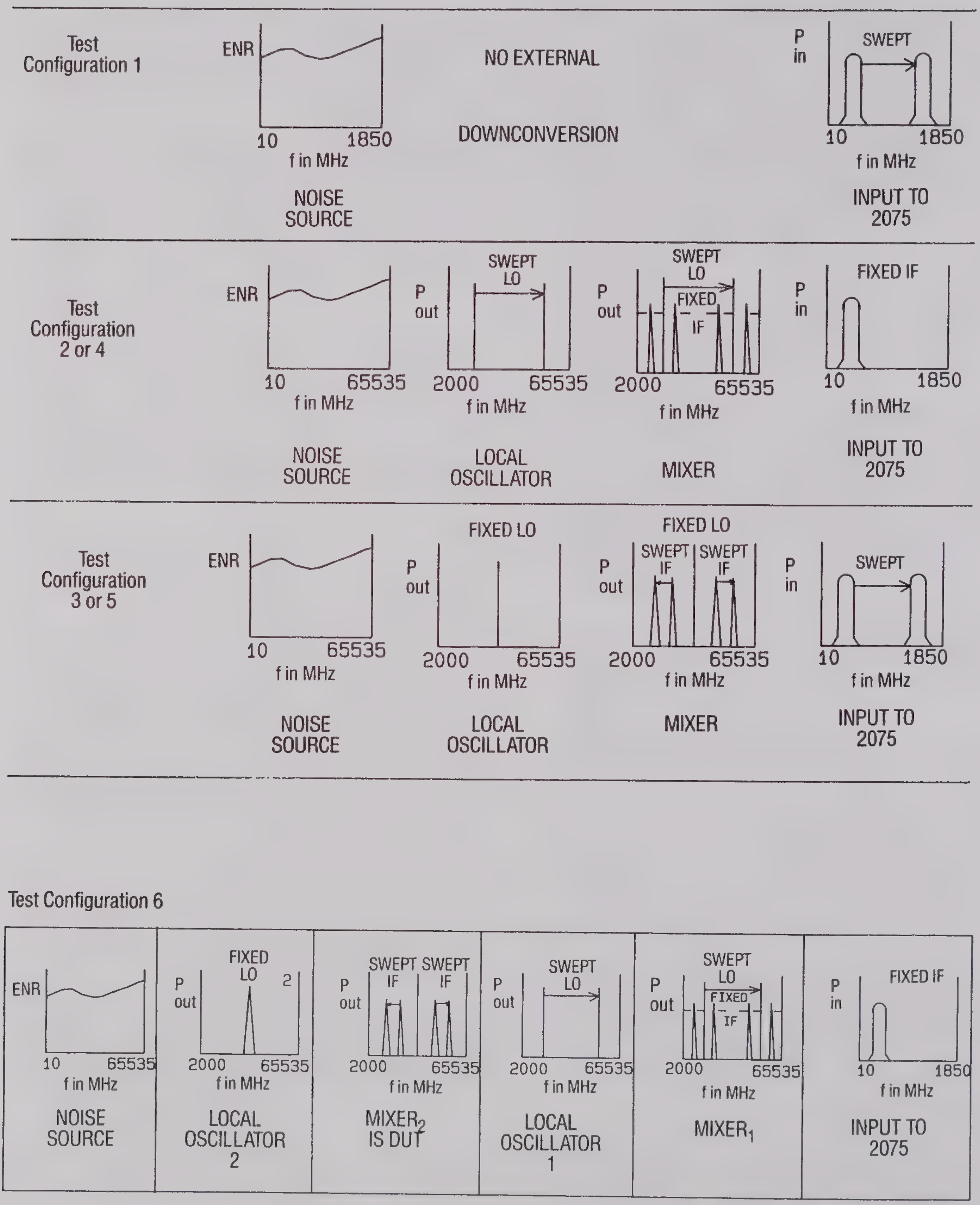

Test Configuration 1
ENR
10
1850
f in MHz
NOISE SOURCE
NO EXTERNAL
DOWNCONVERSION
P in
SWEPT
10
1850
f in MHz
INPUT TO 2075
Test Configuration 2 or 4
ENR
10
65535
f in MHz
NOISE SOURCE
P out
SWEPT LO
2000
65535
f in MHz
LOCAL OSCILLATOR
P out
SWEPT LO
FIXED IF
2000
65535
f in MHz
MIXER
P in
FIXED IF
10
1850
f in MHz
INPUT TO 2075
Test Configuration 3 or 5
ENR
10
65535
f in MHz
NOISE SOURCE
P out
FIXED LO
2000
65535
f in MHz
LOCAL OSCILLATOR
P out
FIXED LO
SWEPT IF
SWEPT IF
2000
65535
f in MHz
MIXER
P in
SWEPT
10
1850
f in MHz
INPUT TO 2075
Test Configuration 6
ENR
10
65535
f in MHz
NOISE SOURCE
P out
FIXED LO
2
2000
65535
f in MHz
LOCAL OSCILLATOR 2
P out
SWEPT IF
SWEPT IF
2000
65535
f in MHz
MIXER2 IS DUT
P out
SWEPT LO
2000
65535
f in MHz
LOCAL OSCILLATOR 1
P out
SWEPT LO
FIXED IF
2000
65535
f in MHz
MIXER1
P in
FIXED IF
10
1850
f in MHz
INPUT TO 2075

Figure 3-4. TEST CONFIGURATION DOWNCONVERSION MODES

3-11. PROCEDURE FOR TEST CONFIGURATION 1

Description

This configuration is used for measurements when:

1. The DUT is an amplifier-type device.
2. DUT output frequencies are between 10 and 1850 MHz. This is the only test configuration where no external downconversion is used. Note that no sideband parameter (double, single upper, or single lower) selection is required in this test configuration since the 2075 internal conversion system is true single sideband.

Equipment Setup

Figures 3-5a and 3-5b are the connection diagrams for calibration and measurement when external relays are not used. Figure 3-6 shows the optional setup where external relays, controlled by the 2075, are used to provide a calibration path. (Refer to Paragraph 3-34, page 3-75.)

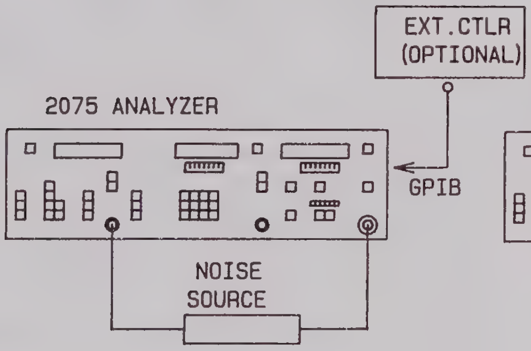

EXT.CTLR (OPTIONAL)
2075 ANALYZER
GPIB
NOISE SOURCE

Figure 3-5a. TEST CONFIGURATION 1 Calibration

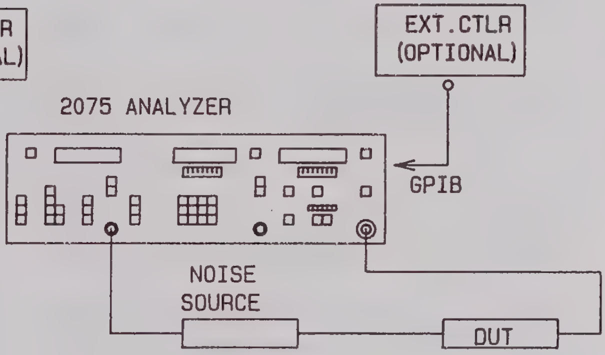

EXT.CTLR (OPTIONAL)
2075 ANALYZER
GPIB
NOISE SOURCE
DUT

Figure 3-5b. TEST CONFIGURATION 1 Measurement

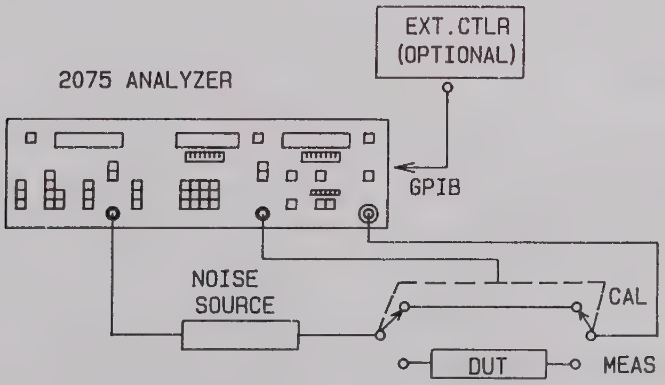

EXT.CTLR (OPTIONAL)
2075 ANALYZER
GPIB
NOISE SOURCE
CAL
DUT
MEAS

Figure 3-6. EXTERNAL RELAYS AUTOMATE CALIBRATION AND MEASUREMENT PATHS

Procedure

This procedure is used for making corrected Noise Figure and Gain swept measurements. Immediately following the procedure, steps are given for making uncorrected Noise Figure measurements, and Fixed Frequency corrected Noise Figure and Gain measurements. In Paragraphs 3-19 through 3-28, steps are given for making other measurements such as Effective Input Noise Temperature, Y-Factor, etc.

1. Connect the test equipment as shown in the calibration setup of Figure 3-5a or the optional setup of Figure 3-6.
2. Apply AC power to the 2075.
3. Press:

   PRESET

   GPIB: Device Clear or Selective Device Clear

   This sets the front panel control parameters to preset values which also selects Test Configuration 1. (See Paragraph 3-4.)
4. Perform the procedure of Paragraph 3-9 to enter frequency/ENR values unless this has previously been done.
5. Perform the following steps if they apply:
   - a. Enter the cold temperature of the noise source. (See Paragraph 3-41, page 3-88.)
   - b. Enter any losses before or after the DUT. (See Paragraph 3-40, page 3-86.)
   - c. Employ bandwidth compensation if required. (see Paragraph 3-38, page 3-82.)
6. Press:

   SPEC FUNC   14.1   ENTER

   GPIB: T1

   This will activate the HOLD function to prevent the 2075 from making measurements before all the front panel control parameters have been entered.
7. To enter the sweep start frequency (for example, 10 MHz), press:

   START FREQ   10   ENTER

   GPIB: FA10MZ
8. To enter the sweep stop frequency (for example, 1850 MHz), press:

   STOP FREQ   1850   ENTER

   GPIB: FB1850MZ
9. To enter the frequency step size (for example, 20 MHz), press:

   STEP SIZE   20   ENTER

   GPIB: SS20MZ
10. To calibrate the setup, press:
    (For information on smoothing, see Paragraph 3-49 on page 3-110.)

    CALIB   GPIB: CA

    This initiates the Second Stage Calibration which measures and stores the Noise Figure of the entire setup, including the Noise Figure of the 2075. First a frequency calibration (FCAL) is done and then a CAL0, CAL1, CAL2, and CAL3. The frequency parameters entered in Steps 7, 8, and 9 determine the frequency points for the calibration. In this case the calibration is done every 20 MHz, from 10 to 1850 MHz. Where external relays are used to provide the calibration path, the 2075 automatically applies voltage to the relays when the **CALIB** key is pressed.

11. Deactivate the HOLD function by pressing:

SPEC FUNC | 14.0 | ENTER

GPIB: TO

When the HOLD is deactivated, the 2075 automatically begins making fixed frequency measurements of corrected Noise Figure and Gain at the start frequency, which in this case is 10 MHz. It makes corrected measurements, as opposed to uncorrected measurements, because the Second Stage Calibration has been performed. It makes fixed frequency measurements, as opposed to swept measurements, because the fixed frequency mode is the default mode, and swept mode has not yet been selected.

12. Insert the Device Under Test into the setup, as shown in Figure 3-5b. If external relays are being used, ignore this step. Upon completing the calibration, the 2075 removes the actuating voltage from the relays to place the DUT in the measurement path (unless Special Function 10.1 has been activated).

13. To initiate a single swept measurement, press:

SHIFT | SWEEP

GPIB: SG

As the 2075 steps through the band each RF frequency will be displayed in Window A, each Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. One single sweep is executed and when completed, the 2075 remains tuned to the stop frequency.

14. To initiate continuous swept measurements, press:

SWEEP

GPIB: SR

As the 2075 steps through the band each RF frequency will be displayed in Window A, each Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. The instrument will continue to make automatic continuous sweeps. While the instrument is sweeping, it will not respond to any front panel keys except the **SWEEP** key. Continuous sweeping can be stopped by pressing the **SWEEP** key. A sweep that has been stopped can be continued from the stopping point by pressing **SHIFT RECALL**, or it can be started over from the beginning by pressing **SWEEP.**

Uncorrected Measurement

An uncorrected measurement can be performed by eliminating the Second Stage Calibration or by pressing the **F** key before initiating the sweep.

Fixed Frequency Measurements

To make a fixed frequency (single frequency) measurement instead of swept frequency, insert the following variations into the procedure above. (The example given is for a fixed frequency measurement at 800 MHz.)

a. In place of Step 7, press:

FIXED FREQ | 800 | ENTER

b. Do not perform Steps 8 and 9.

c. In place of Step 10, Calibration, press:

SHIFT | CALIB

This initiates a calibration at the fixed frequency.

3-12. PROCEDURE FOR TEST CONFIGURATION 2 (FOR DOUBLE SIDEBAND MEASUREMENTS)

Description

This configuration is used for measurements when:

1. The DUT is an amplifier-type device.

2. The DUT output frequencies are higher than 1850 MHz.

3. The RF range over which measurements will be taken is more than 1.6 GHz wide. (Measurements must be made using double sideband mode.)

4. The RF range over which measurements will be taken can be less than 1.6 GHz wide. However, the fixed IF must be low enough in frequency so that the two sidebands are close together and will approximate a single sideband measurement.

In this configuration external downconversion is required. The 2075 or an external controller sweeps the variable local oscillator frequency to produce a fixed frequency IF from the external mixer. The local oscillator must be GPIB compatible. Paragraph 3-44 on page 3-95 contains information on PROM stored control programs for external local oscillators. Paragraph 3-45 on page 3-96 contains information on writing user-defined control programs for external local oscillators.

Equipment Setup

Figures 3-7a and 3-7b are the connection diagrams for calibration and measurement when external relays are not used. An optional setup can be used where external relays, controlled by the 2075, are used to provide a calibration path. (Refer to Paragraph 3-34, page 3-75.)

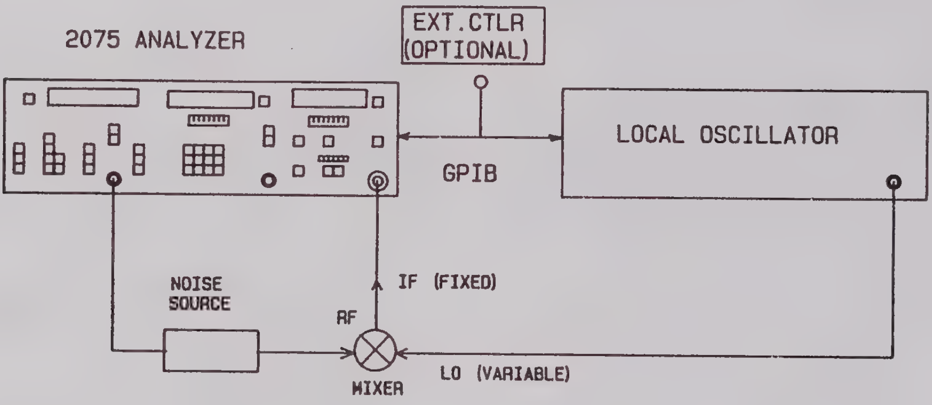

2075 ANALYZER
EXT.CTLR (OPTIONAL)
LOCAL OSCILLATOR
GPIB
NOISE SOURCE
IF (FIXED)
RF
MIXER
LO (VARIABLE)

Figure 3-7a. TEST CONFIGURATION 2 CALIBRATION (DOUBLE SIDEBAND)

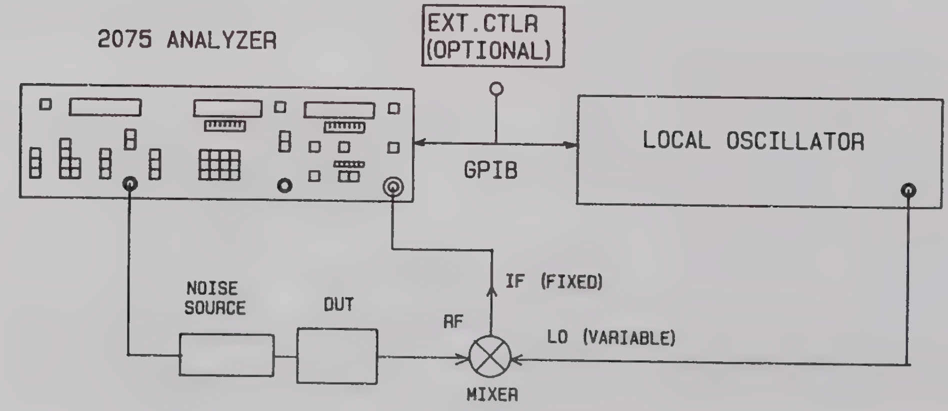

2075 ANALYZER
EXT.CTLR (OPTIONAL)
LOCAL OSCILLATOR
GPIB
NOISE SOURCE
DUT
IF (FIXED)
RF
LO (VARIABLE)
MIXER

Figure 3-7b. TEST CONFIGURATION 2 MEASUREMENT (DOUBLE SIDEBAND)

Procedure

This procedure is used for making corrected Noise Figure and Gain swept measurements. Immediately following the procedure, steps are given for making fixed frequency corrected Noise Figure and Gain measurements. In Paragraphs 3-19 through 3-28, steps are given for making other measurements such as Effective Input Noise Temperature, Y-Factor, etc.

1. Connect the test equipment as shown in the calibration setup of Figure 3-7a or the optional setup using external relays.

2. Apply AC power to the 2075.

3. Press:

   PRESET

   GPIB: Device Clear or Selective Device Clear

   This sets the front panel control parameters to preset values. (See Paragraph 3-4.)

4. Perform the procedure of Paragraph 3-9 to enter Frequency/ENR values, unless this has previously been done.

5. Press:

   SPEC FUNC | 1.2 | ENTER

   GPIB: D2

   This selects Test Configuration 2.

6. Perform the following steps if they apply:

   a. Enter the cold temperature of the noise source. (See Paragraph 3-41, page 3-88.)

   b. Enter any losses before or after the DUT. (See Paragraph 3-40, page 3-86.)

   c. Employ bandwidth compensation if required. (See Paragraph 3-38, page 3-82.)

7. Press:

   SPEC FUNC | 14.1 | ENTER

   GPIB: T1

   This will activate the HOLD function which prevents the 2075 from making measurements before all the front panel control parameters have been entered.

8. To enter the sweep start RF frequency (for example, 8000 MHz), press:

   START FREQ | 8000 | ENTER

   GPIB: FA8000MZ

9. To enter the sweep stop RF frequency (for example, 12000 MHz), press:

   STOP FREQ | 12000 | ENTER

   GPIB: FB12000MZ

10. To enter the frequency step size (for example, 200 MHz), press:

    STEP SIZE | 200 | ENTER

    GPIB: SS200MZ

11. To enter the fixed IF frequency (for example, 15 MHz), press:

    SHIFT | START FREQ | 15 | ENTER

    GPIB: IF15MZ

12. To select double sideband, press:

SPEC FUNC | 2.0 | ENTER

GPIB: A0

13. To select the correct program for controlling the external local oscillator (for example, an HP 8672A local oscillator), press:

SPEC FUNC | 47.0 | ENTER

Refer to Paragraphs 3-44 and 3-45 for more information on control programs.

14. To set the local oscillator power level (Always entered in dBm. In this example it is 6 dBm.), press:

SHIFT | ⇧ | 6 | ENTER

15. To enter the local oscillator settling time, which will allow the local oscillator to stabilize at each frequency before the measurement is made (Always entered in milliseconds. In this example it is 20 ms.), press:

SPEC FUNC | 3.1 | ENTER

20 | ENTER

16. To enter the GPIB address for the external local oscillator (In this example it is 17.), press:

SHIFT | LOCAL | 17 | ENTER

17. To make the 2075 the controller and enable the program which will control the local oscillator, press:

SPEC FUNC | 40.2 | ENTER

18. To calibrate the setup, press: (For information on smoothing, see Paragraph 3-49 on page 3-110.)

CALIB

GPIB: CA

This initiates the Second Stage Calibration which measures and stores the Noise Figure of the entire setup, including the internal Noise Figure of the 2075. First a frequency calibration (FCAL) is done and then a CAL0, CAL1, CAL2, and CAL3. The frequency parameters entered in Steps 8, 9, and 10 determine the frequency points for the calibration. In this case the calibration is done every 200 MHz, from 8000 MHz to 12000 MHz. When external relays are used to provide the calibration path, the 2075 automatically applies voltage to the relays when the **CALIB** key is pressed.

19. Deactivate the HOLD function by pressing:

SPEC FUNC | 14.0 | ENTER

GPIB: T0

When the HOLD is deactivated, the 2075 automatically begins making fixed frequency measurements of corrected Noise Figure and Gain at the start frequency, which in this case is 8000 MHz. It makes corrected measurements, as opposed to uncorrected measurements, because the Second Stage Calibration has been performed. It makes fixed frequency measurements, as opposed to swept measurements, because the fixed frequency mode is the default mode, and swept mode has not yet been selected.

20. Insert the Device Under Test into the setup, as shown in Figure 3-7b. If external relays are being used, ignore this step. Upon completing the calibration, the 2075 removes the actuating voltage from the relays to place the DUT in the measurement path (unless Special Function 10.1 has been activated).

21. To initiate a single swept measurement, press:

SHIFT SWEEP GPIB: SG

As the 2075 steps through the band each RF frequency will be displayed in Window A, each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. One single sweep is executed and when completed, the 2075 remains tuned to the stop frequency.

22. To initiate continuous swept measurements, press:

SWEEP GPIB: SR

As the 2075 steps through the band each RF frequency will be displayed in Window A, each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. The instrument will continue to make automatic continuous sweeps. While the instrument is sweeping, it will not respond to any front panel keys except the **SWEEP** key. Continuous sweeping can be stopped by pressing the **SWEEP** key. A sweep that has been stopped can be continued from the stopping point by pressing **SHIFT RECALL** or it can be started over from the beginning by pressing **SWEEP**.

Uncorrected Measurement

An uncorrected measurement can be performed by eliminating the Second Stage Calibration or by pressing the **F** key before initiating the sweep.

Fixed Frequency Measurements

To make a fixed frequency (single frequency) measurement instead of swept frequency, insert the following variations into the procedure above. (The example given is for a fixed frequency measurement at 9000 MHz.)

a. In place of Step 8, press:

FIXED FREQ 9000 ENTER

b. Do not perform Steps 9 and 10.

c. In place of Step 18, Calibration, press:

SHIFT CALIB

This initiates a calibration at the fixed frequency.

3-13. PROCEDURE FOR TEST CONFIGURATION 2 (FOR SINGLE SIDEBAND MEASUREMENTS)

Description

This configuration is used for measurements when:

1. The DUT is an amplifier-type device.
2. The DUT output frequencies are higher than 1850 MHz.
3. The RF range over which measurements will be taken is less than 1.6 GHz wide. (Measurements are made using single sideband mode only.)
4. The DUT has sharp variations in noise figure across the RF band, such that even a double sideband measurement with a 10 MHz IF is too coarse to resolve the variations.

In this configuration external downconversion is required. The 2075 or an external controller sweeps the variable local oscillator frequency to produce a fixed frequency IF from the external mixer.

The local oscillator must be GPIB compatible. Paragraph 3-44, page 3-95, contains information on PROM stored control programs for external local oscillators. Paragraph 3-45, page 3-96, contains information on writing user defined control programs for external local oscillators.

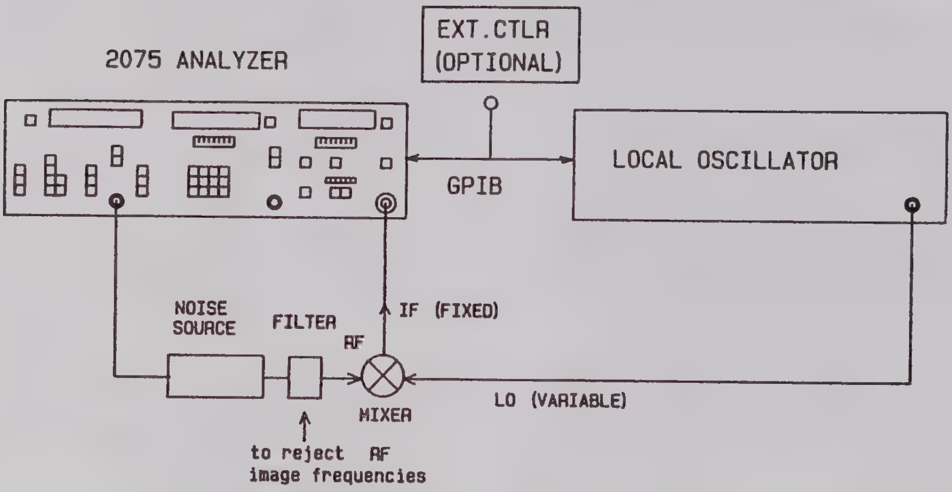

2075 ANALYZER
EXT.CTLR (OPTIONAL)
LOCAL OSCILLATOR
GPIB
NOISE SOURCE
FILTER
RF
IF (FIXED)
MIXER
LO (VARIABLE)
to reject RF image frequencies

Figure 3-8a. TEST CONFIGURATION 2 CALIBRATION (SINGLE SIDEBAND)

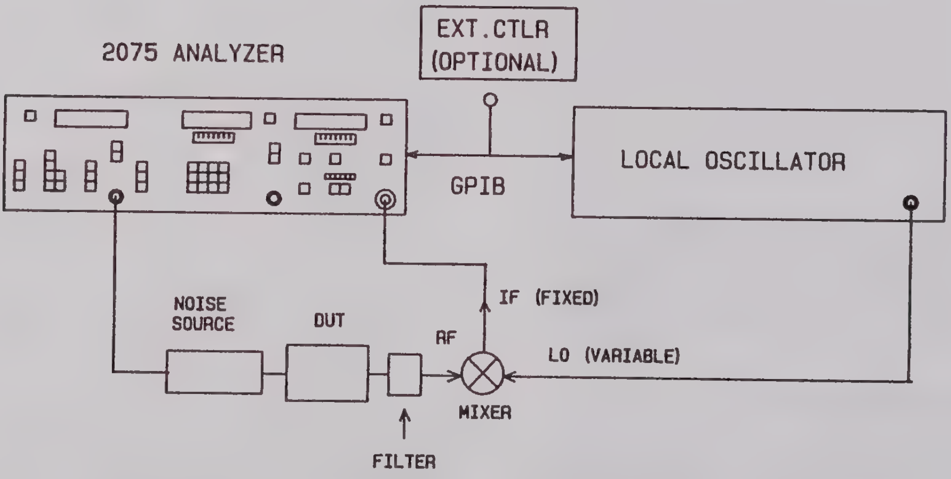

2075 ANALYZER
EXT.CTLR (OPTIONAL)
LOCAL OSCILLATOR
GPIB
NOISE SOURCE
DUT
RF
IF (FIXED)
LO (VARIABLE)
MIXER
FILTER

Figure 3-8b. TEST CONFIGURATION 2 MEASUREMENT (SINGLE SIDEBAND)

Equipment Setup

Figures 3-8a and 3-8b are the connection diagrams for calibration and measurement when external relays are not used. An optional setup can be used where external relays, controlled by the 2075, provide a calibration path. (See Paragraph 3-34, page 3-75.)

Procedure

This procedure is used for making corrected Noise Figure and Gain swept measurements. Immediately following the procedure, steps are given for making fixed frequency corrected Noise Figure and Gain measurements. In Paragraphs 3-19 through 3-28, steps are given for making other measurements such as Effective Input Noise Temperature, Y-Factor, etc.

1. Connect the test equipment as shown in the calibration setup of Figure 3-8a or the optional setup using external relays.

2. Apply AC power to the 2075.

3. Press:

   `PRESET`

   GPIB: Device Clear or Selective Device Clear

   This sets the front panel control parameters to preset values. (See Paragraph 3-4.)

4. Perform the procedure of Paragraph 3-9 to enter Frequency/ENR values unless this has previously been done.

5. Press:

   `SPEC FUNC` `1.2` `ENTER`

   GPIB: D2

   This selects Test Configuration 2.

6. Perform the following steps if they apply:

   a. Enter the cold temperature of the noise source. (See Paragraph 3-41, page 3-88.)

   b. Enter any losses before or after the DUT. (See Paragraph 3-40, page 3-86.)

   c. Employ bandwidth compensation if required. (See Paragraph 3-38, page 3-82.)

7. Press:

   `SPEC FUNC` `14.1` `ENTER`

   GPIB: T1

   This will activate the HOLD function and prevent the 2075 from making measurements before all the front panel control parameters have been entered.

8. To enter the sweep start RF frequency (for example, 8000 MHz), press:

   `START FREQ` `8000` `ENTER`

   GPIB: FA8000MZ

9. To enter the sweep stop RF frequency (for example, 9200 MHz), press:

   `STOP FREQ` `9200` `ENTER`

   GPIB: FB9200MZ

10. To enter the frequency step size (for example, 25 MHz), press:

    `STEP SIZE` `25` `ENTER`

    GPIB: SS25MZ

11. To enter the fixed IF frequency (for example, 1500 MHz), press:

    `SHIFT` `START FREQ` `1500` `ENTER`

    GPIB: IF1500MZ

12. To select the desired single sideband parameter (In this example, lower sideband), press:

    `SPEC FUNC` `2.1` `ENTER`

    GPIB: A1

Upper sideband would be:

SPEC FUNC | 2.2 | ENTER

GPIB: A2

13. To select the correct program for controlling the external local oscillator (for example, an HP8672A local oscillator), press:

SPEC FUNC | 47.0 | ENTER

(Refer to Paragraphs 3-44 and 3-45 for more information on this feature.)

14. To set the local oscillator power level (Always entered in dBm. In this example it is 6 dBm.), press:

SHIFT | ↑ | 6 | ENTER

15. To enter the local oscillator settling time, which will allow the local oscillator frequency to stabilize before each measurement (Always entered in milliseconds. In this example it is 20 ms.), press:

SPEC FUNC | 3 1 | ENTER

20 | ENTER

16. To enter the GPIB address for the external local oscillator (In this example it is 17.), press:

SHIFT | LOCAL | 17 | ENTER

17. To make the 2075 the controller and to enable the program which will control the local oscillator, press:

SPEC FUNC | 40 2 | ENTER

18. To calibrate the setup, press:
(For information on smoothing, see Paragraph 3-49 on page 3-110.)

CALIB

GPIB: CA

This initiates the Second Stage Calibration which measures and stores the Noise Figure of the entire setup, including the Noise Figure of the 2075. First a frequency calibration (FCAL) is done and then a CAL0, CAL1, CAL2, and CAL3. The frequency parameters entered in Steps 8, 9, and 10 determine the frequency points for the calibration. In this case the calibration is done every 25 MHz, from 8000 to 9200 MHz. When external relays are used to provide the calibration path, the 2075 automatically applies voltage to the relays when the **CALIB** key is pressed.

19. Deactivate the HOLD function by pressing:

SPEC FUNC | 14.0 | ENTER

GPIB: T0

When the HOLD is deactivated, the 2075 automatically begins making fixed frequency measurements of corrected Noise Figure and Gain at the start frequency, which in this case is 8000 MHz. It makes corrected measurements, as opposed to uncorrected measurements, because the Second Stage Calibration has been performed. It makes fixed frequency measurements, as opposed to swept measurements, because the fixed frequency mode is the default mode, and swept mode has not yet been selected.

20. Insert the Device Under Test into the setup, as shown in Figure 3-8b. If external relays are being used, ignore this step. Upon completing the calibration, the 2075 removes the actuating voltage from the relays to place the DUT in the measurement path (unless Special Function 10.1 has been activated).

21. To initiate a single swept measurement, press:

SHIFT | SWEEP

GPIB: SG

As the 2075 steps through the band each RF frequency will be displayed in Window A, each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. One single sweep is executed and when completed, the 2075 remains tuned to the stop frequency.

22. To initiate continuous swept measurements, press:

SWEEP

GPIB: SR

As the 2075 steps through the band each RF frequency will be displayed in Window A, each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. The instrument will continue to make automatic continuous sweeps. While the instrument is sweeping, it will not respond to any front panel keys except the **SWEEP** key. Continuous sweeping can be stopped by pressing the **SWEEP** key. A sweep that has been stopped can be continued from the stopping point by pressing **SHIFT RECALL** or it can be started over from the beginning by pressing **SWEEP**.

Uncorrected Measurement

An uncorrected measurement can be performed by eliminating the Second Stage Calibration or by pressing the **F** key before initiating the sweep.

Fixed Frequency Measurements

To make a fixed frequency (single frequency) measurement instead of swept frequency, insert the following variations into the procedure above. (The example given is for a fixed frequency measurement at 8500 MHz.)

a. In place of Step 8, press:

FIXED FREQ 8500 ENTER

b. Do not perform Steps 9 and 10.

c. In place of Step 18, Calibration, press:

SHIFT CALIB

This initiates a calibration at the fixed frequency.

3-14. PROCEDURE FOR TEST CONFIGURATION 3 (USING SINGLE SIDEBAND)

Description

This configuration is used for measurements when:

1. The DUT is an amplifier-type device.
2. The DUT output frequencies are higher than 1850 MHz.
3. The RF range over which measurements will be taken is less than 1.6 GHz wide. (Measurements are made using single sideband mode only.)
4. The DUT has sharp variations in noise figure across the RF band, such that even a double sideband measurement with a 10 MHz IF is too coarse to resolve the variations.
5. A GPIB compatible local oscillator is not available.

In this configuration external downconversion is required. The local oscillator frequency is fixed and need not be controlled by the 2075 or by an external controller. However, if a GPIB compatible local oscillator is available, its fixed frequency and its power level can be controlled by the 2075 or an external controller. In either case, the IF output from the Device Under Test varies and must not exceed 1850 MHz.

Paragraph 3-44, page 3-95, contains information on PROM stored control programs for external local oscillators. Paragraph 3-45, page 3-96, contains information on writing user defined control programs for external local oscillators.

Equipment Setup

Figures 3-9a and 3-9b are the connection diagrams for calibration and measurement when external relays are not used. An optional setup can be used where external relays, controlled by the 2075, provide the calibration path. (See Paragraph 3-34, page 3-75.)

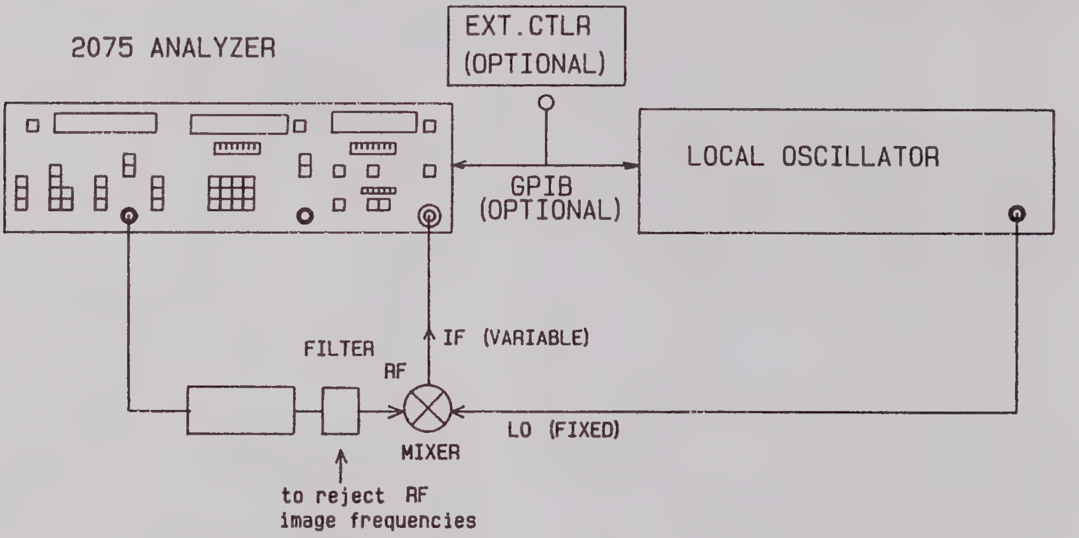

2075 ANALYZER
EXT.CTLR (OPTIONAL)
LOCAL OSCILLATOR
GPIB (OPTIONAL)
FILTER
RF
IF (VARIABLE)
LO (FIXED)
MIXER
to reject RF image frequencies

Figure 3-9a. TEST CONFIGURATION 3 CALIBRATION

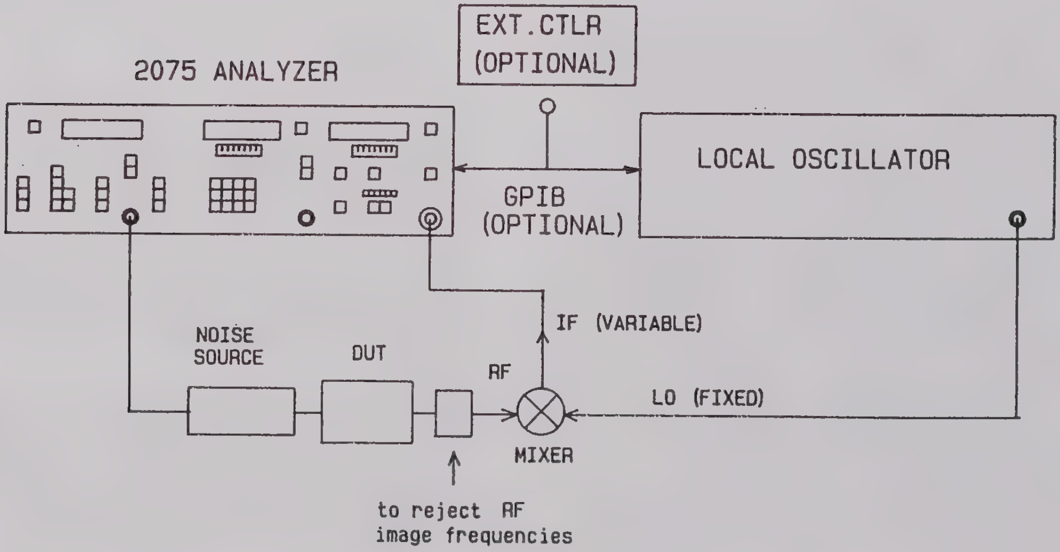

2075 ANALYZER
EXT.CTLR (OPTIONAL)
LOCAL OSCILLATOR
GPIB (OPTIONAL)
IF (VARIABLE)
NOISE SOURCE
DUT
RF
LO (FIXED)
MIXER
to reject RF image frequencies

Figure 3-9b. TEST CONFIGURATION 3 MEASUREMENT

Procedure

This procedure is used for making corrected Noise Figure and Gain swept measurements. Immediately following the procedure, steps are given for making fixed frequency corrected Noise Figure and Gain measurements. In Paragraphs 3-19 through 3-28, steps are given for making other measurements such as Effective Input Noise Temperature, Y-Factor, etc.

1. Connect the test equipment as shown in the calibration setup of Figure 3-9a or the optional setup using external relays for calibration.

2. Apply AC power to the 2075.

3. Press:

   `PRESET`

   GPIB: Device Clear or Selective Device Clear

   This sets the front panel control parameters to preset values. (See Paragraph 3-4.)

4. Perform the procedure of Paragraph 3-9 to enter Frequency/ENR values unless this has previously been done.

5. Press:

   `SPEC FUNC` `1.3` `ENTER`

   GPIB: D3

   This selects Test Configuration 3.

6. Perform the following steps if they apply:

   a. Enter the cold temperature of the noise source. (See Paragraph 3-41, page 3-88.)

   b. Enter any losses before or after the DUT. (See Paragraph 3-40, page 3-86.)

   c. Employ bandwidth compensation if required. (See Paragraph 3-38, page 3-82.)

7. Press:

   `SPEC FUNC` `14.1` `ENTER`

   GPIB: T1

   This will activate the HOLD function. This prevents the 2075 from making measurements before all the front panel control parameters have been entered.

8. To enter the sweep start RF frequency (for example, 5900 MHz), press:

   `START FREQ` `5900` `ENTER`

   GPIB: FA5900MZ

9. To enter the sweep stop RF frequency (for example, 6500 MHz), press:

   `STOP FREQ` `6500` `ENTER`

   GPIB: FB6500MZ

10. To enter the frequency step size (for example, 20 MHz), press:

    `STEP SIZE` `20` `ENTER`

    GPIB: SS20MZ

11. To enter the fixed local oscillator frequency (for example, 7700 MHz), press:

    `SHIFT` `STOP FREQ` `7700` `ENTER`

    GPIB: LO7700MZ

12. To select the desired single sideband parameter (in this example, lower sideband), press:

SPEC FUNC 2.1 ENTER

GPIB: A1

Upper sideband would be:

SPEC FUNC 2.2 ENTER

GPIB: A2

Perform Steps 13 through 16 only if the external local oscillator is under GPIB control. Otherwise, go to Step 17.

13. To select the correct program for controlling the external local oscillator (for example, an HP8672A local oscillator), press:

SPEC FUNC 47.0 ENTER

14. To set the local oscillator power level (Always entered in dBm. In this example it is 6 dBm.), press:

SHIFT ⇧ 6 ENTER

15. To enter the GPIB address for the external local oscillator (In this example it is 17.), press:

SHIFT LOCAL 17 ENTER

16. To make the 2075 the controller and enable the program which will control the local oscillator, press:

SPEC FUNC 40.2 ENTER

17. To calibrate the setup, press:
(For information on smoothing, see Paragraph 3-49 on page 3-110.)

CALIB

GPIB: CA

This initiates the Second Stage Calibration which measures and stores the Noise Figure of the entire setup, including the Noise Figure of the 2075. First a Frequency Calibration (FCAL) is done and then a CAL0, CAL1, CAL2, and CAL3. The frequency parameters entered in Steps 8, 9, and 10 determine the frequency points for the calibration. In this case the calibration is done every 20 MHz, from 5900 to 6500 MHz. When external relays are used to provide the calibration path, the 2075 automatically applies voltage to the relays when the **CALIB** key is pressed.

18. Deactivate the HOLD function by pressing:

SPEC FUNC 14.0 ENTER

GPIB: T0

When the HOLD is deactivated, the 2075 automatically begins making fixed frequency measurements of corrected Noise Figure and Gain at the start frequency, which in this case is 5900 MHz. It makes corrected measurements, as opposed to uncorrected measurements, because the Second Stage Calibration has been performed. It makes fixed frequency measurements, as opposed to swept measurements, because the fixed frequency mode is the default mode, and swept mode has not yet been selected.

19. Insert the Device Under Test into the setup, as shown in Figure 3-9b. If external relays are being used, ignore this step. Upon completing the calibration, the 2075 removes the actuating voltage from the relays to place the DUT in the measurement path (unless Special Function 10.1 has been activated).

20. To initiate a single swept measurement, press:

SHIFT SWEEP

GPIB: SG

As the 2075 steps from the IF's of 1800 to 1200 MHz in steps of 20 MHz, it will display the actual RF frequencies from 5900 MHz to 6500 MHz in Window A. Each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. One single sweep is executed and when completed, the 2075 remains tuned to the stop frequency.

21. To initiate continuous swept measurements, press:

SWEEP GPIB: SR

As the 2075 steps from the IF's of 1800 to 1200 MHz in steps of 20 MHz, it will display the actual RF frequencies from 5900 MHz to 6500 MHz in Window A. Each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. The instrument will continue to make automatic continuous sweeps. While the instrument is sweeping, it will not respond to any front panel keys except the **SWEEP** key. Continuous sweeping can be stopped by pressing the **SWEEP** key. A sweep that has been stopped can be continued from the stopping point by pressing **SHIFT RECALL** or it can be started over from the beginning by pressing **SWEEP**.

Uncorrected Measurement

An uncorrected measurement can be performed by eliminating the Second Stage Calibration or by pressing the **F** key before initiating the sweep.

Fixed Frequency Measurements

To make a fixed frequency (single frequency) measurement instead of swept frequency, insert the following variations into the procedure above. (The example given is for a fixed frequency measurement at 5900 MHz.)

a. In place of Step 8, press:

FIXED FREQ 5900 ENTER

b. Do not perform Steps 9 and 10.

c. In place of Step 17, Calibration, press:

SHIFT CALIB

This initiates a calibration at the fixed frequency.

3-15. PROCEDURE FOR TEST CONFIGURATION 4 (FOR DOUBLE SIDEBAND MEASUREMENTS)

Description

This configuration is used for measurements when:

1. The DUT is a receiver-type device.
2. The DUT output frequencies (IF) are lower than 1850 MHz.
3. The RF range over which measurements will be taken is more than 1.6 GHz wide. (Measurements must be made using double sideband mode.)
4. The RF range over which measurements will be taken can be less than 1.6 GHz wide. However, the fixed IF must be low enough in frequency so that the two sidebands are close together and will approximate a single sideband measurement.

In this configuration external downconversion is performed in the DUT. The 2075 or an external controller sweeps the variable local oscillator frequency to produce a fixed frequency IF from the Device Under Test. The local oscillator must be GPIB compatible.

Paragraph 3-44, page 3-95, contains information on PROM stored control programs for external local oscillators. Paragraph 3-45, page 3-96, contains information on writing user defined control programs for external local oscillators.

Equipment Setup

Figures 3-10a and 3-10b are the connection diagrams for calibration and measurement when external relays are not used. An optional setup can be used where external relays, controlled by the 2075, provide a calibration path. (See Paragraph 3-34, page 3-75.)

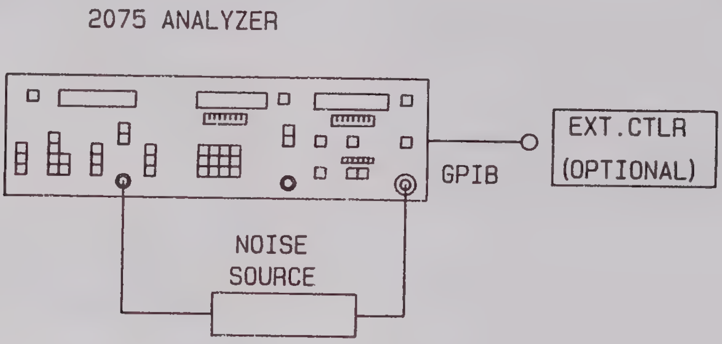

2075 ANALYZER
GPIB
EXT.CTLR (OPTIONAL)
NOISE SOURCE

Figure 3-10a. TEST CONFIGURATION 4 CALIBRATION (DOUBLE SIDEBAND)

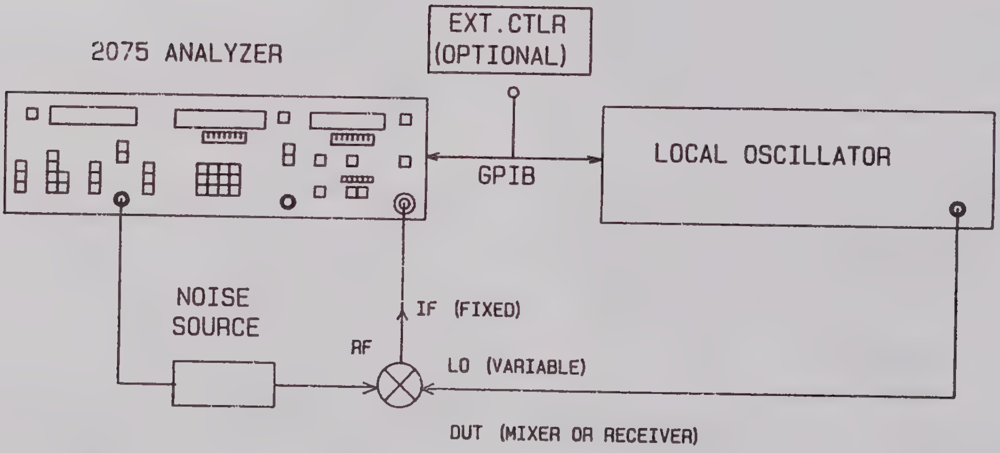

2075 ANALYZER
EXT.CTLR (OPTIONAL)
GPIB
LOCAL OSCILLATOR
NOISE SOURCE
IF (FIXED)
RF
LO (VARIABLE)
DUT (MIXER OR RECEIVER)

Figure 3-10b. TEST CONFIGURATION 4 MEASUREMENT (DOUBLE SIDEBAND)

Procedure

This procedure is used for making corrected Noise Figure and Gain swept measurements. Immediately following the procedure, steps are given for making fixed frequency corrected Noise Figure and Gain measurements. In Paragraphs 3-19 through 3-28, steps are given for making other measurements such as Effective Input Noise Temperature, Y-Factor, etc.

1. Connect the test equipment as shown in the calibration setup of Figure 3-10a or the optional setup where external relays are used to provide the calibration path.

2. Apply AC power to the 2075.

3. Press:

PRESET

GPIB: Device Clear or Selective Device Clear

This sets the front panel control parameters to preset values. (See Paragraph 3-4.)

4. Perform the procedure of Paragraph 3-9 to enter Frequency/ENR values unless this has previously been done.

5. Press:

SPEC FUNC
1.4
ENTER

GPIB: D4

This selects Test Configuration 4.

6. Perform the following steps if they apply:

   a. Enter the cold temperature of the noise source. (See Paragraph 3-41, page 3-88.)

   b. Enter any losses before or after the DUT. (See Paragraph 3-40, page 3-86.)

   c. Employ bandwidth compensation if required. (See Paragraph 3-38, page 3-82.)

7. Press:

SPEC FUNC
14.1
ENTER

GPIB: T1

This will activate the HOLD function. This prevents the 2075 from making measurements before all the front panel control parameters have been entered.

8. To enter the sweep start RF frequency (for example, 6000 MHz), press:

START FREQ
6000
ENTER

GPIB: FA6000MZ

9. To enter the sweep stop RF frequency (for example, 18000 MHz), press:

STOP FREQ
18000
ENTER

GPIB: FB18000MZ

10. To enter the frequency step size (for example, 200 MHz), press:

STEP SIZE
200
ENTER

GPIB: SS200MZ

11. To enter the fixed IF frequency (for example, 10 MHz), press:

SHIFT
START FREQ
10
ENTER

GPIB: IF10MZ

12. To select double sideband, press:

SPEC FUNC
2.0
ENTER

GPIB: A0

13. To select the correct program for controlling the external local oscillator (for example, an HP8672A local oscillator), press:

SPEC FUNC 47.0 ENTER

See Paragraphs 3-44 and 3-45 for information on control programs for external local oscillators.

14. To set the local oscillator power level (Always entered in dBm. In this example it is 6 dBm.), press:

SHIFT ⇧ 6 ENTER

15. To enter the local oscillator settling time, which allows the local oscillator to stabilize each frequency (Always entered in milliseconds. In this example it is 20 ms.), press:

SPEC FUNC 3.1 ENTER

20 ENTER

16. To enter the GPIB address of the external local oscillator (in this example the address is 17), press:

SHIFT LOCAL 17 ENTER

17. To make the 2075 the controller and enable the program which will control the local oscillator, press:

SPEC FUNC 40.2 ENTER

18. To calibrate the setup, press: (For information on smoothing, see Paragraph 3-49 on page 3-110.)

CALIB

GPIB: CA

This initiates the Second Stage Calibration which measures and stores the Noise Figure of the entire setup, including the Noise Figure of the 2075. First a frequency calibration (FCAL) is done and then a CAL0, CAL1, CAL2, and CAL3. The frequency parameters entered in Steps 8, 9, and 10 determine the frequency points for the calibration. In this case the calibration is done at the fixed IF frequency of 10 MHz. When external relays are used to provide the calibration path, the 2075 automatically applies voltage to the relays when the **CALIB** key is pressed.

19. Deactivate the HOLD function by pressing:

SPEC FUNC 14.0 ENTER

GPIB: TO

When the HOLD is deactivated, the 2075 automatically begins making fixed frequency measurements of corrected Noise Figure and Gain at the start frequency, which in this case is 6000 MHz. It makes corrected measurements, as opposed to uncorrected measurements, because the Second Stage Calibration has been performed. It makes fixed frequency measurements, as opposed to swept measurements, because the fixed frequency mode is the default mode, and swept mode has not yet been selected.

20. Insert the Device Under Test into the setup, as shown in Figure 3-10b. If external relays are being used, ignore this step. Upon completing the calibration, the 2075 removed the actuating voltage from the external relays to place the DUT in the measurement path (unless Special Function 10.1 has been activated).

21. To initiate a single swept measurement, press:

SHIFT SWEEP

GPIB: SG

As the 2075 steps through the band each RF frequency will be displayed in Window A, each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. One single sweep is executed and, when completed, the 2075 remains tuned to the stop frequency.

22. To initiate continuous swept measurements, press:

SWEEP GPIB: SR

As the 2075 steps through the band each frequency will be displayed in Window A, each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. The instrument will continue to make automatic continuous sweeps. While the instrument is sweeping, it will not respond to any of the front panel keys except the **SWEEP** key. Continuous sweeping can be stopped by pressing the **SWEEP** key. A sweep that has been stopped can be continued from the stopping point by pressing **SHIFT RECALL** or it can be started over from the beginning by pressing **SWEEP**.

Uncorrected Measurement

An uncorrected measurement can be performed by eliminating the Second Stage Calibration or by pressing the **F** key before initiating the sweep.

Fixed Frequency Measurements

To make a fixed frequency (single frequency) measurement instead of swept frequency, insert the following variations into the procedure above. (The example given is for a fixed frequency measurement at 13000 MHz.)

a. In place of Step 8, press:

FIXED FREQ 13000 ENTER

b. Do not perform Steps 9 and 10.

c. In place of Step 18, Calibration, press:

SHIFT CALIB

This initiates a calibration at the fixed frequency.

3-16. PROCEDURE FOR TEST CONFIGURATION 4 (FOR SINGLE SIDEBAND MEASUREMENTS)

Description

This configuration is used for measurements when:

1. The DUT is a receiver-type device.
2. The DUT output frequencies (IF) are lower then 1850 MHz.
3. The RF range over which measurements will be taken is less than 1.6 GHz wide. (Measurements are made using single side- band mode only.)
4. The DUT has sharp variations in noise figure across the RF band, such that even a double sideband measurement with a 10 MHz IF is too coarse to resolve the variations.

In this configuration external downconversion is performed in the DUT. The 2075 or an external controller sweeps the variable local oscillator frequency to produce a fixed frequency IF from the Device Under Test.

The local oscillator must be GPIB compatible.

Paragraph 3-44, page 3-95, contains information on PROM stored control programs for external local oscillators. Paragraph 3-45, page 3-96, contains information on writing user defined control programs for external local oscillators.

Equipment Setup

Figures 3-11a and 3-11b are the connection diagrams for calibration and measurement when external relays are not used. An optional setup can be used where external relays, controlled by the 2075, provide the calibration path. (See Paragraph 3-34, page 3-75.)

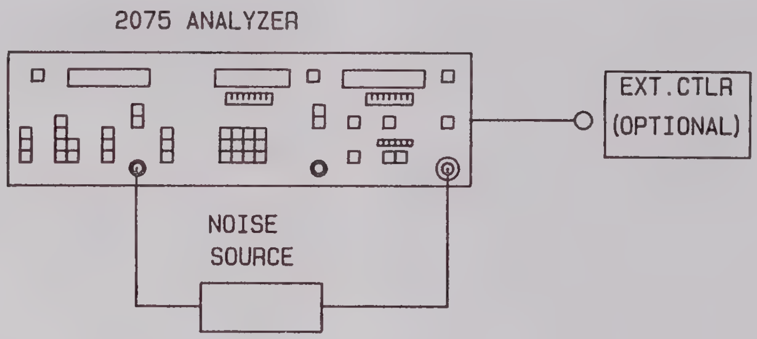

2075 ANALYZER
EXT.CTLR (OPTIONAL)
NOISE SOURCE

Figure 3-11a. TEST CONFIGURATION 4 CALIBRATION (SINGLE SIDEBAND)

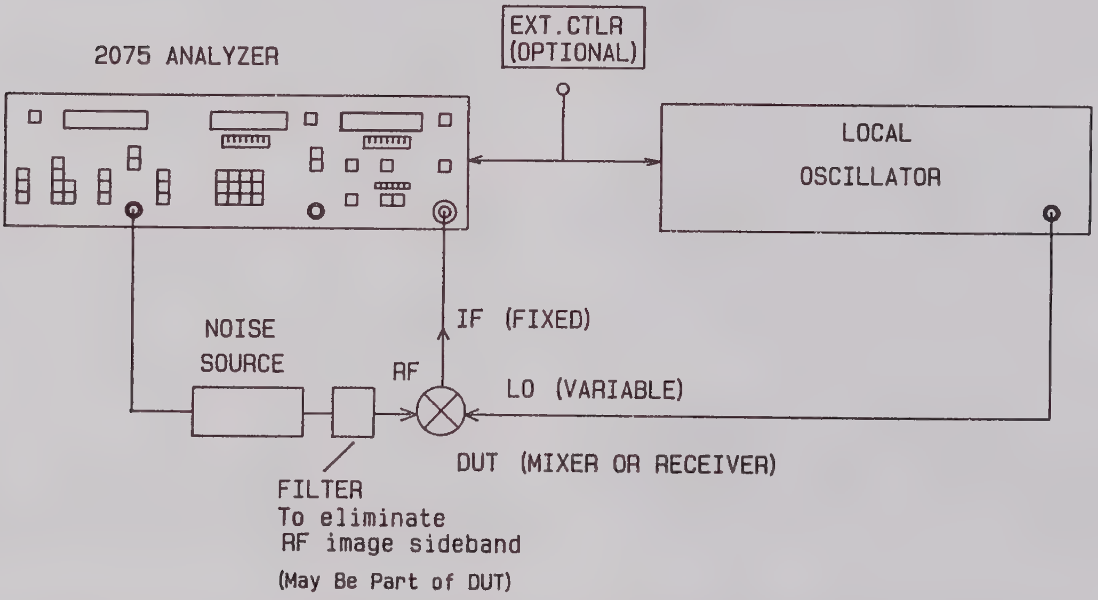

EXT.CTLR (OPTIONAL)
2075 ANALYZER
LOCAL OSCILLATOR
IF (FIXED)
NOISE SOURCE
RF
LO (VARIABLE)
DUT (MIXER OR RECEIVER)
FILTER
To eliminate
RF image sideband
(May Be Part of DUT)

Figure 3-11b. TEST CONFIGURATION 4 MEASUREMENT (SINGLE SIDEBAND)

Procedure

This procedure is used for making corrected Noise Figure and Gain swept measurements. Immediately following the procedure, steps are given for making fixed frequency corrected Noise Figure and Gain measurements. In Paragraphs 3-19 through 3-28, steps are given for making other measurements such as Effective Input Noise Temperature, Y-Factor, etc.

1. Connect the test equipment as shown in the calibration setup of Figure 3-11a or the optional setup using external relays.

2. Apply AC power to the 2075.

3. Press:

PRESET

GPIB: Device Clear or Selective Device Clear

This sets the front panel control parameters to preset values. (See Paragraph 3-4.)

4. Perform the procedure of Paragraph 3-9 to enter frequency/ENR values unless this has previously been done.

5. Press:

SPEC FUNC	1.4	ENTER

GPIB: D4

This selects test configuration 4.

6. Perform the following steps if they apply:

   a. Enter the cold temperature of the noise source. (See Paragraph 3-41, page 3-88.)

   b. Enter any losses before or after the DUT. (See Paragraph 3-40, page 3-86.)

   c. Employ bandwidth compensation if required. (See Paragraph 3-38, page 3-82.)

7. Press:

SPEC FUNC	14.1	ENTER

GPIB: T1

This will activate the HOLD function. This prevents the 2075 from making measurements before all the front panel control parameters have been entered.

8. To enter the sweep start RF frequency (for example, 8000 MHz), press:

START FREQ	8000	ENTER

GPIB: FA8000MZ

9. To enter the sweep stop RF frequency (for example, 9200 MHz), press:

STOP FREQ	9200	ENTER

GPIB: FB9200MZ

10. To enter the frequency step size (for example, 25 MHz), press:

STEP SIZE	25	ENTER

GPIB: SS25MZ

11. To enter the fixed IF frequency (for example, 1700 MHz), press:

SHIFT	START FREQ	1700	ENTER

GPIB: IF1700MZ

12. To select the desired single sideband parameter (In this example, lower sideband), press:

SPEC FUNC	2.1	ENTER

GPIB: A1

Upper sideband would be:

SPEC FUNC	2.2	ENTER

GPIB: A2

13. To select the correct program for controlling the external local oscillator (for example, an HP8350 local oscillator), press:

    SPEC FUNC   47.3   ENTER

    See Paragraphs 3-44 and 3-45 for information on control programs for external local oscillators.

14. To set the local oscillator power level (Always entered in dBm. In this example it is 6 dBm.), press:

    SHIFT   ⇧   6   ENTER

15. To enter the local oscillator settling time, which allows the local oscillator to stabilize at each frequency (Always entered in milliseconds. In this example it is 20 ms.), press:

    SPEC FUNC   3.1   ENTER

    20   ENTER

16. To enter the GPIB address for the external local oscillator (In this example it is 17), press:

    SHIFT   LOCAL   17   ENTER

17. To make the 2075 the controller and enable the program which will control the local oscillator, press:

    SPEC FUNC   40.2   ENTER

18. To calibrate the setup, press:
    (For information on smoothing, see Paragraph 3-49 on page 3-110.)

    CALIB   GPIB: CA

    This initiates the Second Stage Calibration which measures and stores the Noise Figure of the entire setup, including the Noise Figure of the 2075. First a frequency calibration (FCAL) is done and then a CAL0, CAL1, CAL2, and CAL3. In this case the calibration is done at the fixed IF frequency of 1700 MHz. When external relays are used to provide the calibration path, the 2075 automatically applies voltage to the relays when the **CALIB** key is pressed.

19. Deactivate the HOLD function by pressing:

    SPEC FUNC   14.0   ENTER

    GPIB: TO

    When the HOLD is deactivated, the 2075 automatically begins making fixed frequency measurements of corrected Noise Figure and Gain at the start frequency, which in this case is 8000 MHz. It makes corrected measurements, as opposed to uncorrected measurements, because the Second Stage Calibration has been performed. It makes fixed frequency measurements, as opposed to swept measurements, because the fixed frequency mode is the default mode, and swept mode has not yet been selected.

20. Insert the Device Under Test into the setup, as shown in Figure 3-10b. If external relays are being used, ignore this step. Upon completing the calibration, the 2075 removes the actuating voltage from the relays to place the DUT in the measurement path (unless Special Function 10.1 has been activated).

21. To initiate a single swept measurement, press:

    SHIFT   SWEEP   GPIB: SG

    As the 2075 steps through the band each RF frequency will be displayed in Window A, each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. One single sweep is executed and, when completed, the 2075 remains tuned to the stop frequency.

22. To initiate continuous swept measurements, press:

    SWEEP   GPIB: SR

As the 2075 steps through the band each RF frequency will be displayed in Window A, each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. The instrument will continue to make automatic continuous sweeps. While the instrument is sweeping, it will not respond to the front panel keys except for the **SWEEP** key. Continuous sweeping can be stopped by pressing the **SWEEP** key. A sweep that has been stopped can be continued from the stopping point by pressing **SHIFT RECALL** or it can be started over from the beginning by pressing **SWEEP**.

Uncorrected Measurement

An uncorrected measurement can be performed by eliminating the Second Stage Calibration or by pressing the **F** key before initiating the sweep.

Fixed Frequency Measurements

To make a fixed frequency (single frequency) measurement instead of swept frequency, insert the following variations into the procedure above. (The example given is for a fixed frequency measurement at 9000 MHz.)

a. In place of Step 8, press:

FIXED FREQ   9000   ENTER

b. Do not perform Steps 9 and 10.

c. In place of Step 18, Calibration, press:

SHIFT   CALIB

This initiates a calibration at the fixed frequency.

3-17. PROCEDURE FOR TEST CONFIGURATION 5 (SINGLE SIDEBAND)

Description

This configuration is used for measurements when:

1. The DUT is a receiver-type device.
2. The DUT output frequencies (IF) are lower than 1850 MHz.
3. The RF range over which measurements will be made is less than 1.6 GHz wide. (Measurements are made using single sideband mode only.)
4. A GPIB compatible local oscillator is not available.

In this configuration external downconversion is performed in the DUT. The local oscillator frequency is fixed and need not be controlled by the 2075 or by an external controller. However, if a GPIB compatible local oscillator is available, its fixed frequency and its power level can be controlled by the 2075 or an external controller. In either case, the IF output from the Device Under Test varies. The 2075 sweeps to tune to the variable frequency IF from the external mixer.

NOTE

When using Test Configuration 5 for lower single sideband measurements, always use a step size which gives an integral number of steps from the start frequency to the stop frequency.

Equipment Setup

Figures 3-12a and 3-12b are the connection diagrams for calibration and measurement when external relays are not used. An optional setup can be used where external relays, controlled by the 2075, provide the calibration path. (See Paragraph 3-34, page 3-75.)

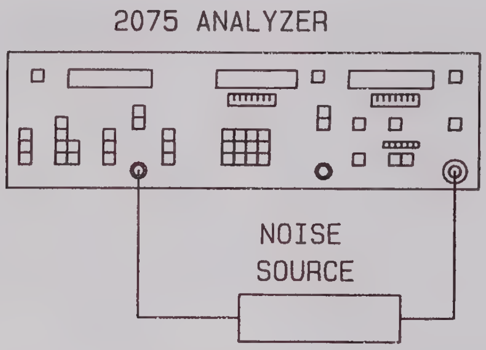

2075 ANALYZER
NOISE SOURCE

Figure 3-12a. TEST CONFIGURATION 5 CALIBRATION

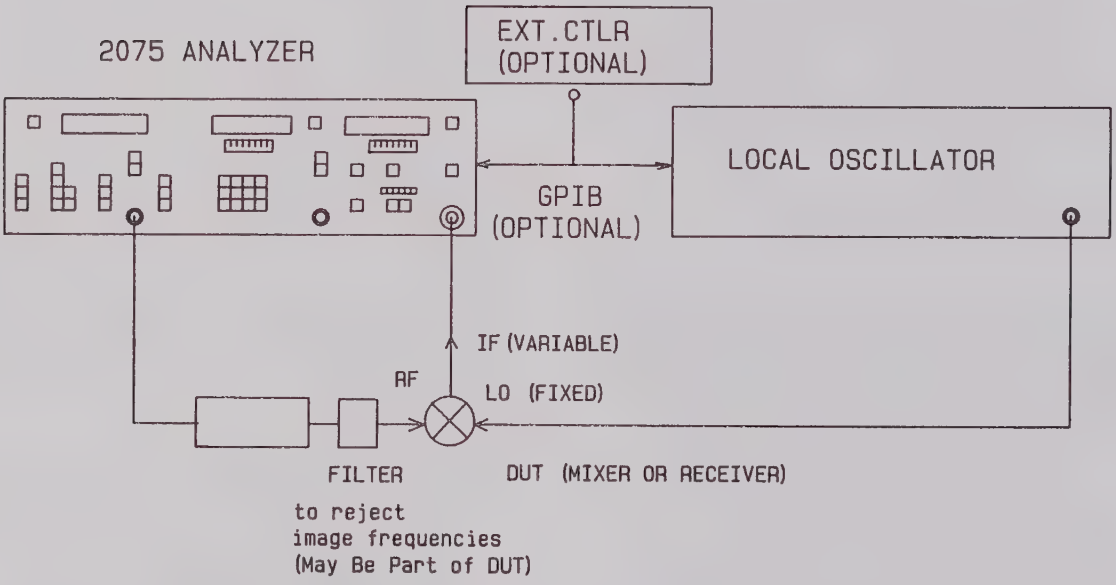

2075 ANALYZER
EXT.CTLR (OPTIONAL)
LOCAL OSCILLATOR
GPIB (OPTIONAL)
IF (VARIABLE)
RF
LO (FIXED)
FILTER
DUT (MIXER OR RECEIVER)
to reject
image frequencies
(May Be Part of DUT)

Figure 3-12b. TEST CONFIGURATION 5 MEASUREMENT

Procedure

This procedure is used for making corrected Noise Figure and Gain swept measurements. Immediately following the procedure, steps are given for making fixed frequency corrected Noise Figure and Gain measurements. In Paragraphs 3-19 through 3-28, steps are given for making other measurements such as Effective Input Noise Temperature, Y-Factor, etc.

1. Connect the test equipment as shown in the calibration setup of Figure 3-12a or the optional setup using external relays.

2. Apply AC power to the 2075.

3. Press:

   PRESET

   GPIB: Device Clear or Selective Device Clear

   This sets the front panel control parameters to preset values. (See Paragraph 3-4.)

4. Perform the procedure of Paragraph 3-9 to enter Frequency/ENR values unless this has previously been done.

5. Press:

   SPEC FUNC 1.5 ENTER

   GPIB: D5

   This selects Test Configuration 5.

6. Perform the following steps if they apply:

   a. Enter the cold temperature of the noise source. (See Paragraph 3-41, page 3-88.)

   b. Enter any losses before or after the DUT. (See Paragraph 3-40, page 3-86.)

   c. Employ bandwidth compensation if required. (See Paragraph 3-38, page 3-82.)

7. Press:

   SPEC FUNC 14.1 ENTER

   GPIB: T1

   This will activate the HOLD function which prevents the 2075 from making measurements before all the front panel control parameters have been entered.

8. To enter the sweep start RF frequency (for example, 10010 MHz), press:

   START FREQ 10010 ENTER

   GPIB: FA10010MZ

9. To enter the sweep stop RF frequency (for example, 11000 MHz), press:

   STOP FREQ 11000 ENTER

   GPIB: FB11000MZ

10. To enter the frequency step size (for example, 20 MHz), press:

    STEP SIZE 20 ENTER

    GPIB: SS20MZ

11. To enter the fixed local oscillator frequency (for example, 9510 MHz), press:

    SHIFT STOP FREQ 9510 ENTER

    GPIB: LO9510MZ

12. To select the desired single sideband parameter (In this example, upper sideband), press:

    SPEC FUNC 2.2 ENTER

    GPIB: A2

Lower sideband would be:

SPEC FUNC 2.1 ENTER

GPIB: A1

Perform Steps 13 through 16 only if the external local oscillator is under GPIB control. Otherwise, go to Step 17.

13. To select the correct program for controlling the external local oscillator (for example, a Wiltron 6600 local oscillator), press:

SPEC FUNC 47.1 ENTER

See Paragraphs 3-44 and 3-45 for information on control programs for external local oscillators.

14. To set the local oscillator power level (Always entered in dBm. In this example it is 6 dBm.), press:

SHIFT ⇧ 6 ENTER

15. To enter the GPIB address for the external local oscillator (In this example the address is 17), press:

SHIFT LOCAL 17 ENTER

16. To make the 2075 the controller and enable the program which will control the local oscillator, press:

SPEC FUNC 40.2 ENTER

17. To calibrate the setup, press: (For information on smoothing, see Paragraph 3-49 on page 3-110.)

CALIB

GPIB: CA

This initiates the Second Stage Calibration which measures and stores the Noise Figure of the entire setup, including the internal Noise Figure of the 2075. First a frequency calibration (FCAL) is done and then a CAL0, CAL1, CAL2, and CAL3. The frequency parameters previously entered determine the frequency points for the calibration. In this case the calibration is done at the IF frequencies from 500 MHz to 1490 MHz, at 20 MHz steps. When external relays are used to provide the calibration path, the 2075 automatically applies voltage to the relays when the **CALIB** key is pressed.

18. Deactivate the HOLD function by pressing:

SPEC FUNC 14.0 ENTER

GPIB: T0

When the HOLD is deactivated, the 2075 automatically begins making fixed frequency measurements of corrected Noise Figure and Gain at the start frequency, which in this case is 10010 MHz. It makes corrected measurements, as opposed to uncorrected measurements, because the Second Stage Calibration has been performed. It makes fixed frequency measurements, as opposed to swept measurements, because the fixed frequency mode is the default mode, and swept mode has not yet been selected.

19. Insert the Device Under Test into the setup, as shown in Figure 3-12b. If external relays are being used, ignore this step. Upon completing the calibration, the 2075 removes the actuating voltage from the relays to place the DUT in the measurement path (unless Special Function 10.1 has been activated).

20. To initiate a single swept measurement, press:

SHIFT SWEEP

GPIB: SG

As the 2075 steps from the IF's of 500 to 1490 MHz in steps of 20 MHz, it will display the actual RF frequencies from 10010 MHz to 11000 MHz in Window A. Each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. One single sweep is executed and when completed, the 2075 remains tuned to the stop frequency.

21. To initiate continuous swept measurements press:

SWEEP

GPIB: SR

As the 2075 steps from the IF's of 500 to 1490 MHz in steps of 20 MHz, it will display the actual RF frequencies from 10010 MHz to 11000 MHz in Window A, each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. The instrument will continue to make automatic continuous sweeps. While the instrument is sweeping, it will not respond to any front panel keys except for the **SWEEP** key. Continuous sweeping can be stopped by pressing the **SWEEP** key. A sweep that has been stopped can be continued from the stopping point by pressing **SHIFT RECALL** or it can be started over from the beginning by pressing **SWEEP**.

Uncorrected Measurement

An uncorrected measurement can be performed by eliminating the Second Stage Calibration or by pressing the **F** key before initiating the sweep.

Fixed Frequency Measurements

To make a fixed frequency (single frequency) measurement instead of swept frequency, insert the following variations into the procedure above. (The example given is for a fixed frequency measurement at 10400 MHz.)

a. In place of Step 8, press:

FIXED FREQ 10400 ENTER

b. Do not perform Steps 9 and 10.

c. In place of Step 17, Calibration, press:

SHIFT CALIB

This initiates a calibration at the fixed frequency.

3-18. PROCEDURE FOR TEST CONFIGURATION 6

Description

This configuration is used for measurements when:

1. The DUT is a receiver-type device.
2. The DUT output frequencies (IF) are higher than 1850 MHz.

In this configuration two stages of external downconversion are performed. The first stage of external downconversion is performed in the DUT. A fixed frequency local oscillator (usually an integral part of the DUT) drives the DUT to produce a variable frequency IF output higher than 1850 MHz. This local oscillator is not controlled by the 2075.

The second stage of external downconversion is performed in an external mixer. This mixer is driven by a variable frequency local oscillator which is controlled by the 2075 or an external controller. This mixer has, as its second input, the variable IF from the DUT. The output of this mixer is a fixed IF frequency below 1850 MHz.

Note that the measurement must be either upper or lower single sideband. Therefore, if the DUT does not have the proper filtering in its front end (most receivers do), then a filter must be placed in front of the DUT to reject the unwanted image sideband. Also note that this filter is not part of the second stage, so its loss must be accounted for by using loss compensation (Section 3-40, page 3-86). The isolator in Figures 13a and 13b, prevents unwanted interaction between the mixer and the DUT, and is part of the second stage.

Paragraph 3-44, page 3-95, contains information on

PROM stored control programs for external local oscillators. Paragraph 3-45, page 3-96, contains information on writing user defined control programs for external local oscillators.

NOTE

> When using Test Configuration 6 for lower single sideband measurements, always use a step size which gives an integral number of steps from the start frequency to the stop frequency.

Equipment Setup

Figures 3-13a and 3-13b are the connection diagrams for calibration and measurement when external relays are not used. An optional setup can be used where external relays, controlled by the 2075, provide the calibration path. (See Paragraph 3-34, page 3-75.)

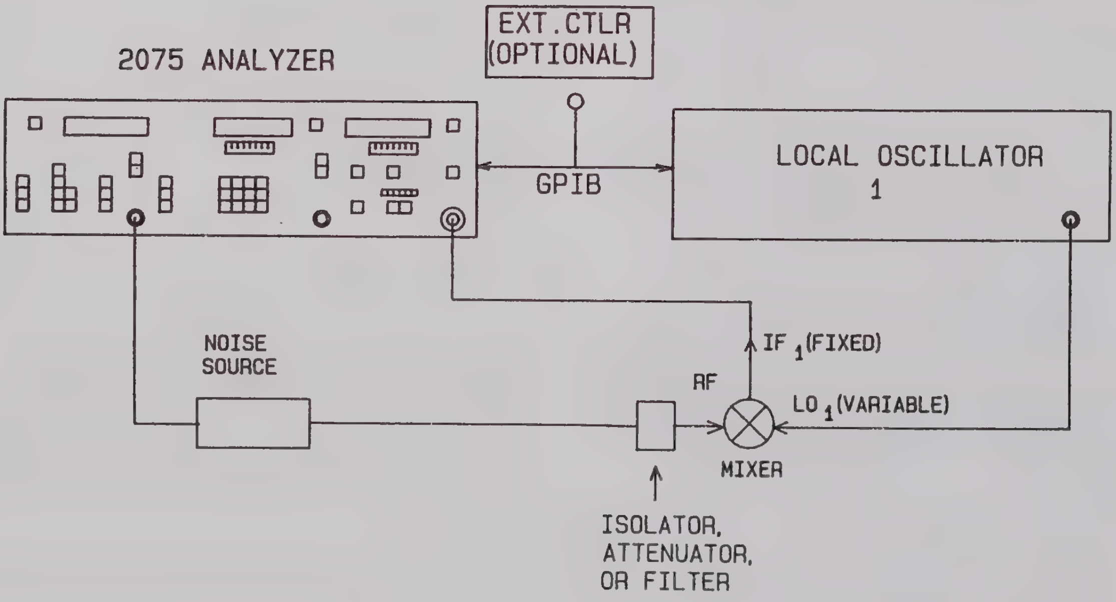

EXT.CTLR
(OPTIONAL)
2075 ANALYZER
GPIB
LOCAL OSCILLATOR
1
NOISE
SOURCE
IF 1 (FIXED)
RF
LO 1 (VARIABLE)
MIXER
ISOLATOR,
ATTENUATOR,
OR FILTER

Figure 3-13a. TEST CONFIGURATION 6 CALIBRATION

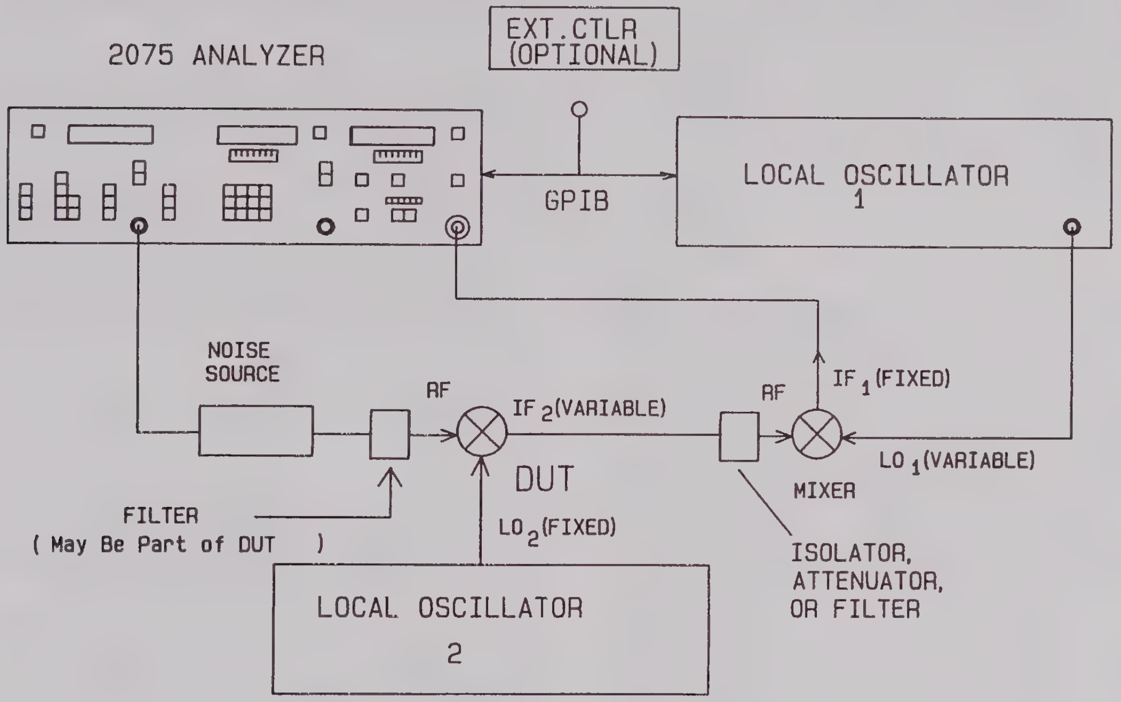

2075 ANALYZER
EXT.CTLR (OPTIONAL)
GPIB
LOCAL OSCILLATOR 1
NOISE SOURCE
RF
IF 2(VARIABLE)
RF
IF 1(FIXED)
DUT
MIXER
LO 1(VARIABLE)
FILTER (May Be Part of DUT)
LO 2(FIXED)
ISOLATOR, ATTENUATOR, OR FILTER
LOCAL OSCILLATOR 2

Figure 3-13b. TEST CONFIGURATION 6 MEASUREMENT

Procedure

This procedure is used for making corrected Noise Figure and Gain swept measurements. Immediately following the procedure, steps are given for making fixed frequency corrected Noise Figure and Gain measurements. In Paragraphs 3-19 through 3-28, steps are given for making other measurements such as Effective Input Noise Temperature, Y-Factor, etc.

1. Connect the test equipment as shown in the calibration setup of Figure 3-13a or the optional setup using external relays.

2. Apply AC power to the 2075.

3. Press:

   PRESET

   GPIB: Device Clear or Selective Device Clear

   This sets the front panel control parameters to preset values. (See Paragraph 3-4.)

4. Perform the procedure of Paragraph 3-9 to enter Frequency/ENR values unless this has previously been done.

5. Press:

   SPEC FUNC 16 ENTER

   GPIB: D6

   This selects Test Configuration 6.

6. Perform the following steps if they apply:

   a. Enter the cold temperature of the noise source. (See Paragraph 3-41, page 3-88.)

   b. Enter any losses before or after the DUT. (See Paragraph 3-40, page 3-86.)

c. Employ bandwidth compensation if required. (See Paragraph 3-38, page 3-82.)

7. Press:

SPEC FUNC | 14.1 | ENTER

GPIB: T1

This will activate the HOLD function. This prevents the 2075 from making measurements before all the front panel control parameters have been entered.

8. To enter the sweep start RF frequency (for example, 42000 MHz), press:

START FREQ | 42000 | ENTER

GPIB: FA42000MZ

9. To enter the sweep stop RF frequency (for example, 46000 MHz), press:

STOP FREQ | 46000 | ENTER

GPIB: FB46000MZ

10. To enter the frequency step size (for example, 100 MHz), press:

STEP SIZE | 100 | ENTER

GPIB: SS100MZ

11. To enter the fixed frequency of the DUT integral local oscillator (for example, 39000 MHz), press:

SHIFT | ⇩ | 39000 | ENTER

GPIB: SL39000MZ

12. To enter the fixed IF output frequency from the external mixer (for example, 20 MHz), press:

SHIFT | START FREQ | 20 | ENTER

GPIB: IF20MZ

13. To select the desired single sideband parameter (In this example upper sideband), press:

SPEC FUNC | 2.2 | ENTER

GPIB: A2

Lower sideband would be:

SPEC FUNC | 2.1 | ENTER

GPIB: A1

14. To select the correct program for controlling the external local oscillator (for example, a Wiltron 6600 local oscillator), press:

SPEC FUNC | 47.1 | ENTER

See Paragraphs 3-44 and 3-45 for information on control programs for external local oscillators.

15. To set the local oscillator power level (Always entered in dBm. In this example it is 6 dBm.), press:

SHIFT ⇧ 6 ENTER

16. To enter the local oscillator settling time, which allows the local oscillator to stabilize before each measurement is made (Always entered in milliseconds. In this example it is 20 ms.), press:

SPEC FUNC 3.1 ENTER

20 ENTER GPIB: ST20

17. To enter the GPIB address for the external local oscillator, LO 1 in Figure 3-13 (in this example the address is 17) press:

SHIFT LOCAL 17 ENTER

18. To make the 2075 the controller and enable the program which will control the local oscillator press:

SPEC FUNC 40.2 ENTER

Refer to paragraphs 3-44 and 3-45 for information on control programs.

19. To calibrate the setup, press:
(For information on smoothing, see Paragraph 3-49 on page 3-110.)

CALIB GPIB: CA

This initiates the Second Stage Calibration which measures and stores the Noise Figure of the entire setup, including the internal Noise Figure of the 2075. First an FCAL (frequency calibration) is done and then a CAL0, CAL1, CAL2, and CAL3. The frequency parameters entered previously determine the frequency points for the calibration. In this case the calibration is done at variable IF frequencies from 3000 MHz to 7000 MHz in 100 MHz steps. When external relays are used to provide the calibration path, the 2075 automatically applies voltage to the relays when the **CALIB** key is pressed.

20. Deactivate the HOLD function by pressing:

SPEC FUNC 14.0 ENTER

GPIB: T0

When the HOLD is deactivated, the 2075 automatically begins making fixed frequency measurements of corrected Noise Figure and Gain at the start frequency, which in this case is 42000 MHz. It makes corrected measurements, as opposed to uncorrected measurements, because the Second Stage Calibration has been performed. It makes fixed frequency measurements, as opposed to swept measurements, because the fixed frequency mode is the default mode, and swept mode has not yet been selected.

21. Insert the Device Under Test into the setup, as shown in Figure 3-13b. If external relays are being used, ignore this step. Upon completing the calibration, the 2075 removed voltage from the relays to place the DUT in the measurement path (unless Special Function 10.1 has been activated).

22. To initiate a single swept measurement, press:

SHIFT SWEEP GPIB: SG

As the 2075 sweeps from the 42000 to 46000 MHz in steps of 100 MHz, it will display the actual RF frequency in Window A. Each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. One single sweep is executed and when completed, the 2075 remains tuned to the stop frequency.

23. To initiate continuous swept measurements, press:

SWEEP GPIB: SR

As the 2075 sweeps from 42000 to 46000 MHz in steps of 100 MHz, it will display the actual RF frequency in Window A. Each corrected Gain value will be displayed in Window B, and each corrected Noise Figure value will be displayed in Window C. The instrument will continue to make automatic continuous sweeps. While the instrument is sweeping, it will not respond to any front panel keys except the **SWEEP** key. Continuous sweeping can be stopped by pressing the **SWEEP** key. A sweep that has been stopped can be continued from the stopping point by pressing **SHIFT RECALL** or it can be started over from the beginning by pressing **SWEEP**.

Uncorrected Measurement

An uncorrected measurement can be performed by eliminating the Second Stage Calibration or by pressing the **F** key before initiating the sweep.

Fixed Frequency Measurements

To make a fixed frequency (single frequency) measurement instead of swept frequency, insert the following variations into the procedure above. (The example given is for a fixed frequency measurement at 42500 MHz.)

a. In place of Step 8, press:

FIXED FREQ 42500 ENTER

b. Do not perform Steps 9 and 10.

c. In place of Step 19, Calibration, press:

SHIFT CALIB

This initiates a calibration at the fixed frequency.

3-19. ADDITIONAL TYPES OF MEASUREMENTS

In addition to Noise Figure and Gain measurements, the 2075 can make other noise related measurements. These are listed below in Table 3-5. Note that some of these measurements can be made in cascade (uncorrected) only, some can be made as First Stage (corrected) only, and some can be made either way.

Table 3-5. Additional Measurements

MEASUREMENT	SYMBOL	MODE
Effective Input Noise Temperature	T_e	Cascade or First Stage
Y-Factor	Y	Cascade only
Operating Noise Temperature	T_{op}	Cascade or First Stage
Power	dB PWR	First Stage only
ENR	dB PWR	First Stage only
Noise Measure	M	First Stage only

The detailed measurement procedures given for each test configuration (Paragraphs 3-11 through 3-18) are the basic procedures for any automatic measurement. It is always necessary to select the correct test configuration, to enter frequency parameters, etc. Second Stage Calibration must always be performed before a corrected measurement is made. The basic difference in performing one type of noise measurement instead of another, is in the keystroke sequence which selects the type of measurement. For example, to select T_{op}, the keys **SPEC FUNC 11.2 ENTER** are pressed. To select M, the keys **SPEC FUNC 11.5 ENTER** are pressed. After the specific measurement is selected, it is executed in the same manner as in the basic procedures. That is, the **SHIFT SWEEP** or **SWEEP** keys must be pressed to execute single or continuous swept measurements. Although the basic procedures do not vary in most cases, some additional or different steps may be required for a particular type of measurement. The following paragraphs present the pertinent details and procedural differences where required for each type.

3-20. EFFECTIVE INPUT NOISE TEMPERATURE (T_e) MEASURMENT

Effective Input Noise Temperature (T_e) is the noise temperature at the input of a noiseless equivalent of the DUT that would cause the noiseless DUT to have the same noise output as the actual DUT. T_e is always measured in kelvins. It is related to Noise Figure by the equation:

$$T_e = (F - 1) \times 290 \text{ (kelvins)}$$

Where F is the noise figure expressed as a ratio.

When measuring T_e there is no change in the basic measurement setup or procedure.

To make a cascade measurement of T_e, press:

SHIFT F GPIB: TE

To make a first stage (corrected) measurement of T_e, after Second Stage Calibration, press:

SHIFT F+G GPIB: TG

Then press the appropriate keys to make single or continuous swept measurement. The result is displayed in Window C and is always expressed in kelvins. Window B will display the Gain of the DUT in dB or as a ratio.

3-21. Y-FACTOR (Y) MEASUREMENT

Y-Factor is a ratio of the noise power output from the DUT when the noise source is ON (or hot) to the noise power output from the DUT when the noise source is OFF (or cold). It can be expressed as dB or as a ratio.

Y-Factor measurement can be made as an automatic or as a manual measurement. The automatic procedure is given below. The manual procedure is given in Paragraph 3-28. Y-Factor is always a cascade measurement and so Second Stage Calibration is not required.

When measuring Y-Factor there is no change in the basic measurement setup or procedure as given for each test configuration.

To measure Y-Factor, press:

SPEC FUNC 11.1 ENTER

Then press the **SWEEP** or **SHIFT SWEEP** keys to execute single or continuous swept measurement. The results will be displayed in Window C. The measurement can be displayed as dB or as a ratio by pressing the **dB/RATIO** key.

3-22. OPERATING NOISE TEMPERATURE (T_{op}) MEASUREMENT

Operating Noise Temperature is a measure of the total noise of a receiving system, including the antenna noise, when it is situated in its normal operating environment. T_{op} is related to the Effective Input Noise Temperature by the equation:

$$T_{op} = T_e + T_a$$

Where T_a is the noise temperature of the antenna.

T_{op} measurements can be made as cascade or as first stage measurements. Figures 3-14a and b below show the equipment configurations for calibration and measurement. Although the figures show an example using Test Configuration 1, any appropriate test configuration can be used.

When making T_{op} measurements, Loss Compensation may be employed to compensate for the coupler attenuation factor. Because this coupling attenuation occurs between the noise source and the DUT, it is entered as Loss 1, using Special Function 18.1. For detailed information on Loss Compensation refer to Paragraph 3-40.

The temperature of the loss, which is the ambient temperature, is entered using Special Function 18.2.

If there is a loss following the DUT, and it is not part of the second stage, it must be entered as Loss 2. If there is a loss following the DUT, but it is part of the second stage, enter a value of 0 for Loss 2. Loss 2 is entered using Special Function 18.3

Although Special Functions 18.1, 18.2, and 18.3 must be used to enter the loss values, it is not necessary to enter Special Function 17.1 to activate the loss compensation function. It will be activated automatically when the T_{op} measurement is done.

After the loss compensation values have been entered, perform the Second Stage Calibration (if a corrected measurement is desired).

Special Function 11.2 is entered to select the T_{op} measurement.

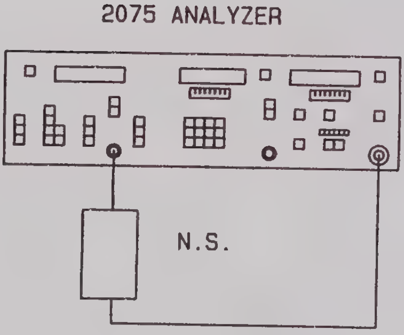


Figure 3-14a. T_{op} SETUP-CALIBRATION

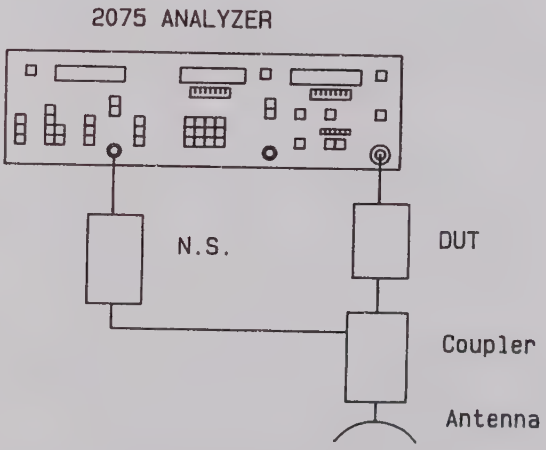


Figure 3-14b. T_{op} SETUP-MEASUREMENT

The 2075 will make a corrected or uncorrected measurement depending on which mode it is in when the measurement is performed. A single swept measurement is executed by pressing the **SHIFT** and **SWEEP** keys. Continuous swept measurements are executed by pressing the **SWEEP** key. If Second Stage Calibration has just been performed, the 2075 will be in the corrected measurement mode, and will make a first stage measurement. If no Second Stage Calibration has been performed, it will make an uncorrected measurement.

However, if the calibration has been performed, and an uncorrected measurement is desired, put the instrument back in uncorrected mode by pressing the **F** key. Then press the approriate keys to execute the measurement. Alternately, to get back to the corrected measurement mode, press the **F + G** key. Then press the appropriate keys to make the measurement.

The following example is given to show the steps which are added to the basic measurement procedure.

1. To enter the coupler attenuation as Loss 1 (for example, 10 dB), press:

   SPEC FUNC   18.1   ENTER

   10   ENTER

2. To enter the loss temperature (for example, 296.5 kelvins), press:

   SPEC FUNC   18.2   ENTER

   296.5   ENTER

3. To enter Loss 2 (for example, 0 dB), press:

   SPEC FUNC   18.3   ENTER

   0   ENTER

4. Perform the Second Stage Calibration in the normal manner.

5. To select the measurement, press:

   SPEC FUNC   11.2   ENTER

6. To make the measurement, press the apropriate keys which select single sweep or continuous sweeps (per the basic procedure).

The measurement results will be displayed in Window C. The units of display are kelvins.

GPIB codes: Special Function 18.1 is L1
Special Function 18.2 is L2
Special Function 18.3 is L3
Special Function 11.2 is OP

3-23. POWER (dB) MEASUREMENTS

Measurements of noise power density relative to −174 dBm/Hz can be made using Special Functions 11.3 and 11.4. Minus 174 dBm is the thermal noise level at 290 kelvins for a 1 Hz bandwidth. The noise power density measurements made by the 2075 are displayed in dB, relative to this −174 dBm/Hz level. The equation is as follows:

$$\text{Power (dB)} = 10 \log \frac{(T_{\text{unknown}})}{T_0}$$

Where T_0 is the 290 K reference temperature and T_{unknown} equals the temperature which is proportional to the unknown power density.

This measurement can be made either as an uncorrected or a corrected measurement. The uncorrected measurements assume a nominal noise figure value of 6 dB for the second stage. Uncorrected measurements are not accurate and are not recommended.

When making a power measurement, perform the basic procedure as given for the appropriate test configuration. Perform the procedure up to and including the Second Stage Calibration. Then place the DUT in the setup and perform the following steps:

To select the measurement with the noise source OFF, press:

SPEC FUNC | 11.3 | ENTER

To select the measurement with the noise source ON, press:

SPEC FUNC | 11.4 | ENTER

Then press the approriate key to execute the swept measurement. The measurement results, in each case, are displayed in Window C. The units of display are dB relative to 290 kelvins (-174 dBm/Hz).

The GPIB code for Special Function 11.3 is PM
The GPIB code for Special Function 11.4 is PN

3-24. ENR MEASUREMENT

The 2075 can be used to measure the ENR values of a noise source. In this procedure, Second Stage Calibration is performed using a noise source with known ENR values. The noise source with unknown values is then installed in the test setup and measured using Special Function 11.6. The calculation for this measurement is:

$$ENR = 10 \log \frac{T_h - 290}{290}$$

Where T_h is the hot or ON temperature of the noise source being measured.

The calibration and measurement setups are shown in Figures 3-15a and b below. The illustrations are for Test Configuration 1, however the measurement can be performed using any configuration, as required, depending upon measurement frequency.

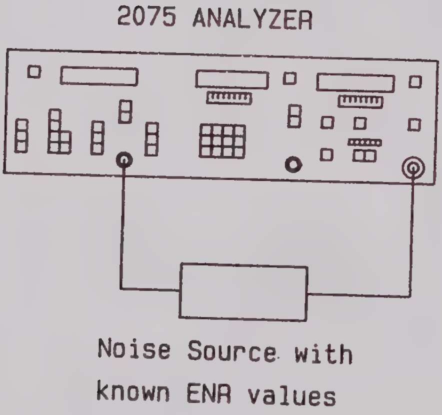


Figure 3-15a. ENR SETUP - CALIBRATION

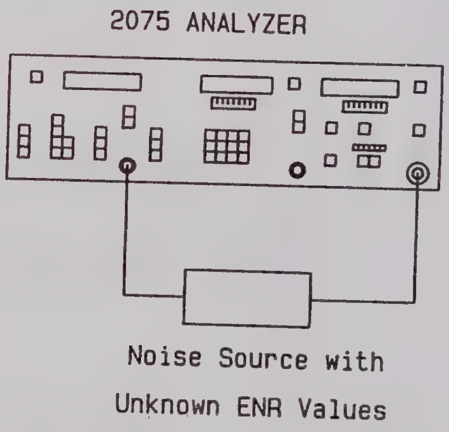


Figure 3-15b. ENR SETUP - MEASUREMENT

Perform the steps as given in the detailed procedure for the appropriate test configuration up to and including the Second Stage Calibration. Then perform the following steps:

To select the ENR measurement, press:

SPEC FUNC   11.6   ENTER

Connect the noise source with unknown ENR values in place of the noise source with known values (Figure 3-15b).

Press the appropriate keys to make a single sweep or continuous swept measurements. The results will be displayed in Window C and the dB PWR annunciator will be lit. The units of display are dB but can be changed to a ratio by pressing the **dB/RATIO** key.

3-25. NOISE MEASURE (M) MEASUREMENT

Noise Measure (M) is a parameter which includes both Noise Figure and Gain. This parameter is typically used by transistor manufacturers as a figure of merit. The formula for computing M is as follows:

$$M = \frac{(F - 1)}{1 - 1/G}$$

Where F = Noise Figure of the DUT expressed as a ratio and G = Gain of the DUT expressed as a ratio.

Noise Measure can be performed only as a corrected measurement.

The basic measurement procedure does not change from those given for each test configuration. Perform the steps up to and including Second Stage Calibration and then install the DUT in the setup. Select M by pressing:

SPEC FUNC   11.5   ENTER

Press the appropriate keys to execute a swept measurement. The measurement results for M will be displayed in Window C. The results for Gain will be displayed in Window B.

3-26. MANUAL MEASUREMENTS

The 2075 can make manual measurements of Noise Figure and Gain or Y-Factor. A true hot/cold thermal noise source is generally used for manual measurement of Noise Figure and Gain. A continuously variable, precision, calibrated attenuator is required for manual Y-Factor measurements. Manual measurements can be made only at fixed frequencies.

The following paragraphs detail the procedures for manual measurement of Noise Figure and Gain, and Y-Factor.

3-27. MANUAL MEASUREMENT OF NOISE FIGURE AND GAIN

A true hot/cold noise source, such as the Eaton 7009, is generally used for this measurement. The following procedure is for making a corrected measurement. An uncorrected measurement of Noise Figure can be made by omitting Steps 7 through 10.

1. Enter the T_{hot} value, in kelvins, of the hot noise source. For example, if the T_{hot} value is 373 kelvins, press:

   SHIFT   ENR   373   ENTER

   (The Preset value of T_{hot} is 9893 K. The current value for T_{hot} is displayed in Window B as soon as the **SHIFT** and **ENR** keys are pressed.)

   Special Function 12 can be set to 12.1 to allow temperature entries to be made in Centrigrade or it can be set to 12.2 to allow entries in Fahrenheit.

2. Enter the T_{cold} value, in kelvins, of the cold noise source. For example, if the T_{cold} value is 78 kelvins, press:

   SHIFT ON/OFF 78 ENTER

   (The Preset value of T_{cold} is 296 kelvins. The current value for T_{cold} is displayed in Window B as soon as the **SHIFT** and **ON/OFF** keys are pressed.)

   Special Function 12 can be set to 12.1 to allow temperature entries to be made in Centrigrade or it can be set to 12.2 to allow entries in Fahrenheit.

3. Select the desired amount of smoothing by pressing the **RIGHT ARROW** or **LEFT ARROW** keys. To obtain accurate, stable measurements, it is recommended that a smoothing factor of 16 or 32 be employed (4 or 5 LED light bars lit).

4. Tune the 2075 to the desired measurement frequency (for example, 1175 MHz) by pressing:

   FIXED FREQ 1175 ENTER

5. Select the manual measurement mode by pressing:

   SPEC FUNC 6.1 ENTER

   Double hyphens will appear in the front panel displays.

6. Connect the hot noise source to the 2075 RF INPUT.

7. The Second Stage Calibration procedure consists of four steps. Initiate the calibration sequence by pressing:

   CALIB

   The messages FCAL and then CAL0 will appear in Window B. Double bars will be displayed in Window C when this step is completed.

8. Continue the calibration sequence for the hot noise source by pressing:

   ON/OFF

   The messages CAL1, CAL2, CAL3, and then CAL0 will appear in Window B. During this process the green NOISE DRIVE LED will light to indicate that the hot calibration is being performed and Window C will display double bars.

9. Disconnect the hot noise source and connect the cold noise source to the RF INPUT.

10. Complete the calibration sequence by pressing:

    ON/OFF

    The messages CAL1, CAL2, and then CAL3 will appear in Window B. While each of these appears, its calibration noise figure data will be displayed in Window C. During this step the green NOISE DRIVE LED will be extinguished. When this step is completed, the red LED in the **F + G** key will light.

11. The 2075 is now ready to make the measurements.

12. Disconnect the cold noise source.

13. Connect the Device Under Test between the hot noise source and the RF INPUT.

14. Start the hot cycle measurement by pressing:

    ON/OFF

    The hot cycle measurement is completed when the annunciators light in Windows B and C. Double bars will be displayed in Windows B and C, and the green NOISE DRIVE LED will be lit.

15. Disconnect the hot noise source and connect the cold noise source to the DUT.

16. Initiate the cold cycle measurement by pressing:

    ON/OFF

    The green NOISE DRIVE LED will go out and, when the measurement is completed, the Noise Figure value will be displayed in Window C. The Gain will be displayed in Window B.

18. To perform another measurement cycle, repeat Steps 13 through 16.

There are no GPIB codes associated with the manual measurement function except for the special function codes (all special function codes can be sent to the 2075 via GPIB).

Output can be directed to a printer if the printer is in LISTEN ONLY mode and the 2075 is in TALK ONLY mode. Refer to the table of GPIB codes, Table 4-3.

3-28. MANUAL MEASUREMENT OF Y-FACTOR

Measurement of Y-Factor can be accomplished either automatically or manually. The automatic measurement of Y-Factor is accomplished using Special Function 11.1 and the procedure for this method is given in Paragraph 3-21.

Manual measurement of Y-Factor requires a continuously variable precision attenuator such as the Eaton 32 Series. In general, such attenuators are optimized for operation at a single frequency, typically 30 MHz. If the DUT operates at a different frequency, it will be necessary to convert the DUT output frequency to that of the attenuator. Even if frequency conversion is required, the measurement can be performed using Test Configuration 1.

This method gives a very precise result by removing the uncertainties which are due to the 2075. When making this measurement the 2075 is set to voltmeter mode by selecting Special Function 20.1. The measurement can be made only at a fixed frequency.

To make the manual Y-Factor measurement, connect the test equipment as shown in Figure 3-16 below and then perform the steps given.

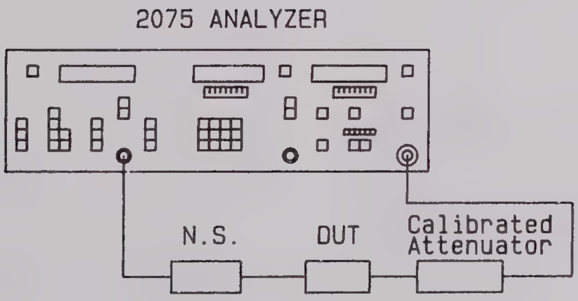


Figure 3-16. MANUAL Y-FACTOR MEASUREMENT

1. Tune the 2075 to the desired frequency of measurement (for example, 70 MHz) by pressing:

   FIXED FREQ | 70 | ENTER

   GPIB: FF70ET

2. To place the 2075 in the voltmeter mode, press:

   SPEC FUNC | 20.1 | ENTER

   GPIB: SP20.1ET

3. Set the attenuator to some value which is greater than the expected Y-Factor measurement value (for example, 15.0 dB). Usually, 15 to 20 dB will be enough. The gain of the DUT plus this initial attenuator setting should be greater than 25 dB.

4. Increase the smoothing to its maximum, or near maximum, value by pressing:

   ⇨

5. To turn on the noise source voltage, press:

   ON/OFF

   GPIB: SP20.1ET

   The green NOISE DRIVE indicator will light when the voltage is on.

6. Observe and record the exact voltage readout given in Window A. (For example, 2.9805)

7. To turn off the noise source voltage, press:

   ON/OFF

   GPIB: SP20.0ET

   The green NOISE DRIVE indicator will go out when the voltage is off.

8. Reduce the value of the precision variable attenuator until the voltage displayed in Window A is exactly the same as it was in Step 6. (For example, the attenuator is reduced to 5.35 dB to again obtain a voltage reading of 2.9805.)

9. Compute the difference between the attenuator settings in Step 6 and Step 8. This difference is the Y-Factor in dB. (For example, 15.0 dB minus 5.35 dB. The difference is 9.65 dB and this is the Y-Factor of the DUT.)

3-29. CALIBRATED NOISE SOURCE

The noise source is an accurately calibrated device which, when stimulated by the NOISE DRIVE voltage, continuously generates white, broadband noise over a known frequency range. The noise source output is characterized as a series of ENR (Excess Noise Ratio) values. The calibration data for a given noise source consists of ENR values (expressed in decibels) at discrete frequency points across its band. Figure 3-17 opposite is a graphic example of calibration data for an Eaton 7618E Solid State Noise Source.

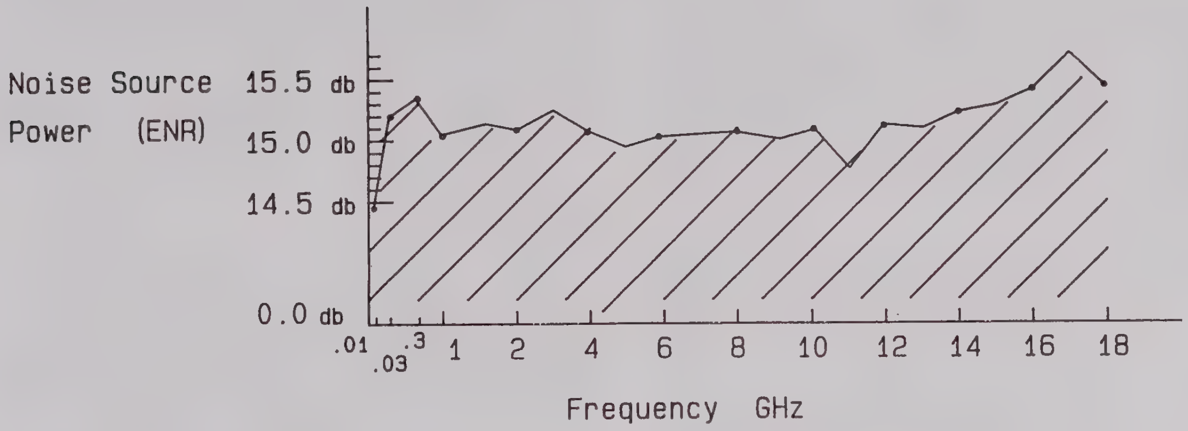


Figure 3-17. EXAMPLE OF CALIBRATED NOISE SOURCE DATA (EATON 7618E CALIBRATED NOISE SOURCE)

These ENR values are inscribed on the calibration label which is affixed to the noise source and are also listed on the calibration data sheet accompanying each Eaton Solid State Noise Generator. The ENR values and their associated frequencies are entered into the ENR Tables of the 2075 by the user before any measurements can be made. Each frequency entry is paired with the ENR value at that frequency. For more information see Paragraphs 3-9 and 3-31.

For especially high frequency applications, a Gas Discharge Noise Generator and a Gas Discharge Noise Generator Power Supply, such as the Eaton 7175, may be used with the 2075. In such a case, a time delay value must be entered. The time delay is always entered in milliseconds and the valid range is from 1 ms to 10 seconds (10,000 ms). To enter the time delay for a gas discharge noise source, for example 75 ms, press:

SPEC FUNC   3.1   ENTER

75   ENTER

To activate the time delay, press:

SPEC FUNC   22.1   ENTER

Generally a time delay of 1 millisecond is sufficient.

3-30. NOISE DRIVE VOLTAGE AND INDICATOR

When measurements are made, the 2075 supplies pulses which turn the noise source on and off. These pulses are supplied via the front and rear panel NOISE DRIVE connectors. The ON voltage level is 28.00 volts DC, ± .05 volts. The OFF level is less than 1.0 volt.

The green indicator located immediately above the NOISE DRIVE connector can be programmed to turn on and off synchronously with the pulses. This feature is typically used when making manual measurements requiring a true hot/cold thermal noise source.

Special Function 21.0 is the default or normal mode for the indicator. When this mode is in effect, the indicator is always off, regardless of the voltage applied to the noise source. To activate the indicator, press:

SPEC FUNC   21.1   ENTER

In this mode the indicator will turn on when the noise drive voltage is on, and turn off when the voltage is off. The GPIB code for this is SP 21.1 ET.

3-31. ENR TABLES

Before making noise measurements, it is necessary to enter noise source calibration data into an ENR table. The 2075 has 4 ENR tables in which ENR values (noise source calibration data) can be stored. An optional fifth table is available in the form of a ROM chip which can be ordered with the noise source. A complete procedure for entering ENR values is given in Paragraph 3-9 on page 3-26.

Table 0	stores only one ENR value which is used for all frequencies. At the factory, a value of 15.5 dB is entered into this table. This value may be changed by the user.
Table 1	stores up to 31 ENR values with 31 associated frequencies. Each ENR value and its associated frequency are stored as a pair.
Table 2	stores up to 31 ENR values with 31 associated frequencies. Each ENR value and its associated frequency are stored as a pair.
Table 3	stores up to 31 ENR values with 31 associated frequencies. Each ENR value and its associated frequency are stored as a pair.
Table 4	This table is an optional ROM chip which can be purchased with a matching noise source. The chip contains permanently stored ENR values and associated frequencies for the noise source.

Tables 1, 2, and 3 can be used to store calibration data for three different noise sources. In each of these tables, frequency and ENR values are stored in pairs. That is, each frequency is stored with the ENR value for that frequency. The valid range for frequency entries is 10 MHz through 65,535 MHz. The maximum allowable ENR entry is 80 dB. However, the effective ENR at the input of the DUT cannot exceed 18 dB. The extra range (the difference between 18 and 80 dB) is to allow for losses between the noise source and the DUT.

ENR values are always entered as dB. ENR values below -9.99 dB will be automatically displayed as a ratio after entry.

Table Selection

A table must be selected before its contents can be viewed, before ENR values can be entered, before a Second Stage Calibration is performed, or before a measurement is made. In other words, before performing any operation which involves an ENR table, a table must first be selected by the user.

Special Function 5 is used to select the table. Table 0 is selected by Special Function 5.0. Tables 1 through 3 are selected by Special Functions 5.1 through 5.3 respectively. The optional ROM chip, Table 4, is selected by Special Function 5.4. To select Table 3, for example, press:

SPEC FUNC 5.3 ENTER

The 2075 always remembers which ENR table was last selected and will automatically select that table after it is switched on. If no table has ever been previously selected, the instrument selects Table 0 by default.

Editing Table Contents

Figure 3-18 shows how the data is organized in Tables 1, 2, or 3. Although only 9 entry pairs are shown, up to 31 can be stored.

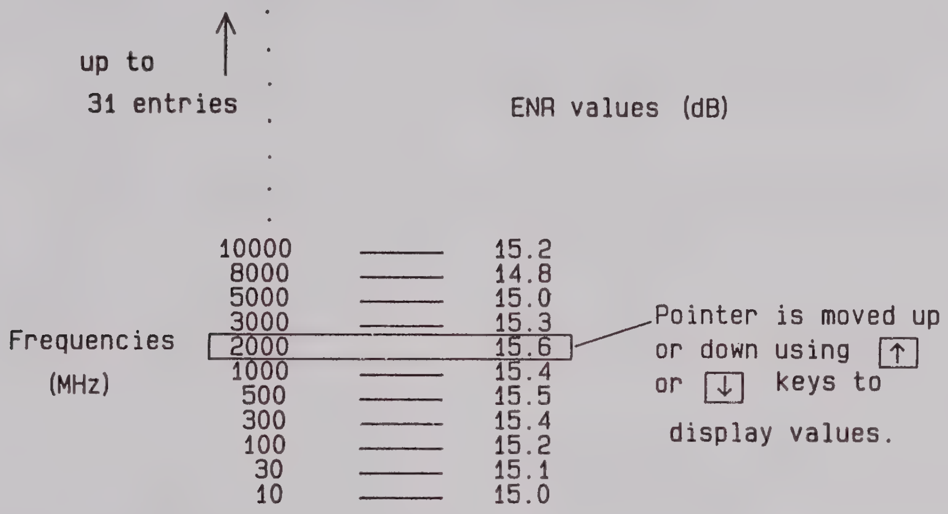


Figure 3-18. ENR TABLE 1, 2 OR 3.

After a table has been selected its contents can easily be examined or edited. To get into the editing mode (this is the same as the data entry mode), press:

ENR

The red light in the **ENR** key will light. The lowest frequency in the table is displayed in Window A and the ENR value for that frequency is displayed in Window B. The ENTER annunciator in Window A begins flashing.

To step through the table and view the data, use the **UP ARROW** and **DOWN ARROW** keys. Each keystroke of the **UP ARROW** key causes the next highest frequency and its ENR value to be displayed. Holding the **UP ARROW** key will cause rapid movement through the table in ascending frequency order. When the highest frequency is reached, the table will wrap around and begin again at the lowest frequency. Pressing or holding the **DOWN ARROW** key causes movement through the table in the opposite direction.

To delete a table entry, first display the entry using the **UP ARROW** or **DOWN ARROW** keys. Then press **CLEAR**. Both the frequency and the ENR value which were displayed are deleted.

The ENTER annunciators in Windows A and B guide the user in making entries.

The ENTER annunciator in Window A blinks to indicate that a frequency may be entered. The ENTER annunciator in Window B blinks to indicate that an ENR value may be entered. After the indicated entry is made, the blinking annunciator automatically shifts to the other window.

The **ENTER** key can be used to toggle the blinking ENTER annunciator back and forth between Windows A and B. For example, if the annunciator is blinking in Window B, but the user desires to enter a new frequency value, pressing the **ENTER** key will cause the annunciator to begin blinking in Window A.

When entering a frequency and ENR value, the frequency must always be entered first. Before entering the frequency the ENTER annunciator must be blinking in Window A.

To enter a frequency (for example, 1000 MHz), press:

1000 ENTER

The frequency, 1000 MHz, will be displayed in Window A and the ENTER annunciator will begin blinking in Window B. To enter the ENR value for 1000 MHz (for example, 15.7 dB), press:

15.7 ENTER

The value 15.7 will be displayed in Window B. Note that the ENTER annunciator now begins to blink in Window A again, indicating that another frequency may now be entered.

To change an existing frequency or ENR value in a table, first use the **UP ARROW** or **DOWN ARROW** keys to display the entry which is to be modified.

To delete both the displayed frequency and the displayed ENR value, press: **CLEAR**. It does not matter whether the ENTER annunciator is blinking in Window A or Window B, both will be deleted.

To change an ENR value, but not the frequency, first make sure that the blinking ENTER annunciator is in Window B. Then press the appropriate numeric keys and then the **ENTER** key to overwrite the old value with the new one. The new ENR value is stored with the displayed frequency.

A frequency cannot be modified. It must be deleted and then a new frequency and ENR value entered.

It is not necessary to enter frequency and ENR values in ascending frequency sequence. The 2075 automatically organizes all entries and stores them in order.

After completing the examination or editing of the table, press the **ENR** key. The red light in the center of the **ENR** key will go off and the instrument exits the ENR mode.

The 2075 accesses the data in the selected ENR table whenever a Second Stage Calibration is performed or when a measurement is taken. The ENR values are used during the calculation of second stage noise figures at each calibration point, and also during calculation of first stage (Device Under Test) noise figure.

During calibration and measurement, the 2075 interpolates ENR values for frequencies between those stored in the table.

GPIB code examples are given:

Table Select:	SP 5.x ET
Enable ENR entry mode:	EN
Entry pairs:	10 MZ 15.5 DB 100 MZ 14.9 DB 300 MZ 15.1 DB etc.
Exit ENR entry mode:	EN

3-32. CALIBRATION

During normal operation of the 2075 two types of calibration are performed by the user. These are Frequency Calibration (FCAL) and Second Stage Calibration. A third calibration, IF Attenuators Calibration, should be performed during normal recalibration procedures if the instrument has been unused for a long period of time, or if a total system reset (Special Function 0.9) has been done. These calibrations are separate and distinct from other procedures covered in the maintenance manual under Alignments and Adjustments. Alignment and adjustment procedures are those typically performed once or twice a year by a calibration facility which then issues a calibration certificate for the instrument.

The following paragraphs cover Frequency Calibration, Second Stage Calibration, and IF Attenuators Calibration.

3-33. FREQUENCY CALIBRATION

Frequency calibration consists of tuning the first local oscillator inside the 2075 to the first IF frequency of 2200 MHz. This automatic procedure ensures the accuracy of the displayed tuned frequency. The message FCAL is displayed on the front panel while this is in progress.

A Frequency Calibration is initiated by any of the following:

1. AC power is applied to the 2075.
2. The **CALIB** key is pressed.
3. The **PRESET** key is pressed.
4. A Total System Reset (Special Function 0.9) is performed.
5. According to the setting of Special Function 15.

Special Function 15 determines when and how often Frequency Calibration will be performed.

Special Function 15.0 is the normal and default Frequency Calibration mode. In this mode, a Frequency Calibration is automatically performed after power-on at intervals of 1 minute, 2 minutes, 4 minutes, and 8 minutes. Thereafter, it is performed every 8 minutes.

Special Function 15.1 causes one Frequency Calibration to be performed immediately. Then Special Function 15 reverts to the mode which was in effect before 15.1 was initiated (15.0 or 15.2).

Special Function 15.2 disables the periodic Frequency Calibration mode set by 15.0. In this mode, Frequency Calibration is not performed periodically nor is it performed when the **CALIB** key is pressed.

To initiate any special function setting (for example, 15.2), press:

SPEC FUNC 15.2 ENTER

GPIB: SP 15.2 ET

3-34. SECOND STAGE CALIBRATION

SECOND STAGE CALIBRATION is the measurement of the Noise Figure of the second stage at discrete frequency points across the band. These measurements are taken at up to 100 frequency points for each of three different input gain settings.

The term SECOND STAGE refers to the 2075 and any other equipment which is part of the measurement system, following the Device Under Test. The term FIRST STAGE refers only to the Device Under Test and any components between the noise source and the DUT.

Before any corrected measurement can be made, a Second Stage Calibration must be performed to measure the Noise Figure of the second stage. Then, after the Device Under Test is connected into the system and measured, the effects of second stage noise are subtracted to achieve a highly accurate, corrected, first stage measurement.

External relays can be used to automate the Second Stage Calibration. When the calibration is performed the 2075 applies an actuating voltage to the relays which switch to the calibration path, leaving the DUT out of the circuit. When the calibration is completed, the 2075 removes the voltage from the relays thereby placing the DUT in the circuit. The relay voltage is supplied via the front panel RELAY POWER connector. This voltage can be set to +5, +15, or +30 volts DC using the procedure of Paragraph 2-6. The factory setting is + 30 volts DC. Figure 3-19 illustrates a setup for Test Configuration 2, single sideband, using external relays. When Special Function 10.1 is activated, the relay power will remain on even after the calibration is completed.

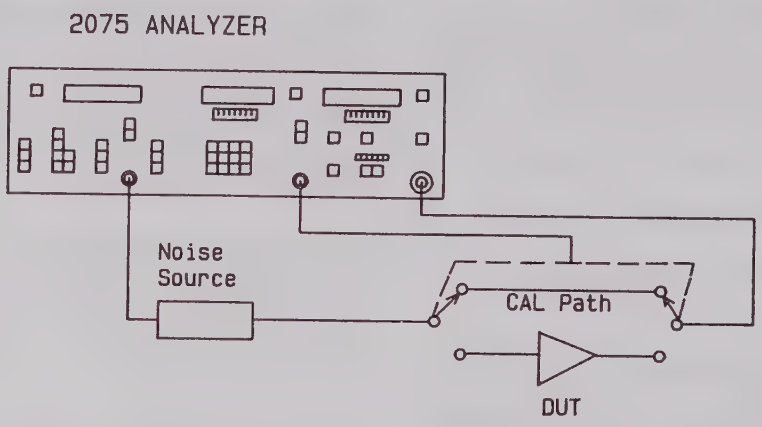


Figure 3-19. SETUP WITH EXTERNAL RELAYS USED TO AUTOMATE CALIBRATION

The start frequency, stop frequency, and step size which are entered as sweep parameters determine the points at which Second Stage Calibration data is taken. In order to obtain accurate corrected measurements, the calibration points must be the same as the measurement points. Second stage calibration can be done at a maximum of 100 points. If a measurement is attempted at an uncalibrated frequency point, error message 110 will be displayed. However, enabling Special Function 24.1 causes the 2075 to interpolate additional calibration points and allows measurement at those frequencies. Such measurements are less accurate.

If calibration is attempted at more than 100 points, calibration table overflow occurs and error message 117 is displayed.

To perform a Second Stage Calibration for swept measurements, press:

CALIB

The 2075 performs a frequency calibration and then the second stage calibration. During this process the front panel successively displays:

FCAL	during the Frequency Calibration (FCAL is not performed if Special Function 15 is set to 15.2)
CAL0	during initialization of the calibration tables
CAL1	during calibration at the first input gain setting (+25 dB)
CAL2	during calibration at the second input gain setting (+10 dB)
CAL3	during calibration at the third input gain setting (−5 dB)

A Second Stage Calibration in progress can be stopped by pressing the **CALIB** key.

Input gain settings are user-selectable. The default settings are +25 dB, +10 dB, and -5 dB. Where an external amplifier is part of the second stage, and its gain is greater than 20 dB, a different set of input gain settings must be selected. For more information on input gain settings see Paragraph 3-35 and Special Function 16.

To perform a single frequency Second Stage Calibration at a fixed frequency, press:

SHIFT CALIB

The 2075 does the FCAL, CAL0, CAL1, CAL2, and CAL3 at the single fixed frequency.

When a calibration is completed, the 2075 automatically goes into the corrected measurement mode, more specifically, the F + G mode.

Calibration data is saved until a new calibration is performed or until AC power is removed from the instrument.

The calibration process disables all front panel keys except for the **CALIB** key which may be pressed to abort a calibration.

In order to save time when a high degree of smoothing is in use, the calibration process can be stopped after CAL1 is completed. This should be done only if this first calibration range is sufficient for the measurement which is to be made. If the calibration is stopped immediately after the CAL 1 range is done, then Range 2 (CAL2) and Range 3 (CAL3) data will not be taken. Therefore, measurements made in those ranges will not be valid.

Likewise, the calibration process can be stopped after completion of the CAL2. In this case no new calibration data is taken for the CAL3 range and, therefore, a measurement requiring CAL3 data would be invalid. After a calibration is stopped prematurely, and the measurement is made, if the calibrated range is insufficient for the measurement, no error message will occur. It is the responsibility of the user to insure that when a calibration is aborted, the ranges which were performed will be sufficient for the measurement to be taken.

3-35. INPUT GAIN SELECTION

During Second Stage Calibration, data is taken at three different input gain settings. The input gain settings are determined by the levels of RF attenuation the 2075 places in its RF amplifier section. The greater the external gain of the second stage, the more attenuation is required.

Where an external amplifier with more than 4 dB of gain is part of the Second Stage, a group of input gain settings must be chosen by the user. The correct input gain settings will prevent the input to the 2075 from exceeding the allowable power range of the Final Detector.

There are three groups of input gain settings available and they are shown below:

ALLOWABLE SECOND STAGE EXTERNAL GAIN	INPUT GAIN SETTING GROUPS	SPECIAL FUNCTION	GPIB CODE
4 dB or less	0, -15, -30 dB	16.1	C0
4 dB to 25 dB	-15, -30, -40 dB	16.2	C1
25 dB to 38 dB	-30, -40, -55 dB	16.3	C2

The first group, 0, -15, and -30 dB, is the normal or default selection.

To select a group(for example, the second group), press:

SPEC FUNC | 16.2 | ENTER

GPIB: SP16.2ET

Gain Measurement Range

Although the 2075 specifications list the gain range as -20 to +50 dB, this maximum figure is actually a worst case situation which assumes a DUT input bandwidth of 1900 MHz or greater.

The 2075 is actually capable of measuring gains greater than 50 dB depending on the bandwidth of the Device Under Test. For instance, if the DUT bandwidth is reduced to 190 MHz, the 2075 can measure greater than 60 dB of gain. Reducing the bandwidth of the DUT to 19 MHz would further increase the available gain range to 70 dB or greater.

The total gain measurement range of the 2075 can be expressed as a function of bandwidth ratios as follows:

$$\text{Gain Measurement Range} = 10 \text{ Log} \left[\frac{1900}{\text{BW of DUT}} \right] + 50$$

3-36. IF ATTENUATORS CALIBRATION

The IF Attenuators Calibration procedure is included as part of the Performance Verification Procedures covered in Section 5 of this manual. Those procedures should be performed on a new 2075, and again at six month intervals. This paragraph is included here to give additional information on IF Attenuators Calibration.

At approximately six month intervals, the IF attenuators should be calibrated to compensate for minor shifts in the attenuator values. Where the 2075 is subjected to wide variations of ambient temperature, the attenuators should be calibrated more frequently. The IF attenuators must also be calibrated after the 2075 has undergone a total system reset (Special Function 0.9).

During the IF Attenuators Calibration, the 2075 turns off the power to the noise source and measures each of the attenuators in its IF stage, using its own noise power detector. The resulting data is stored in battery backed-up memory and later used to correct gain measurements. This calibration takes only a few seconds. When it is completed, the 2075 reverts to its normal operating mode. This calibration data is erased when a total system reset is performed.

To perform an IF Attenuators Calibration, remove all devices connected to the RF input. Then, to save the present states of the front panel control parameters in front panel storage register 0, press:

PRESET

After the PRESET, press:

SPEC FUNC 19.1 ENTER

During the five steps, the front panel will display the following messages:

CAL0 CAL1 CAL2 CAL3 CAL4

During CAL0, all IF attenuation is removed. During CAL1, the 5 dB IF attenuator is measured. During CAL2, the 10 dB attenuator is measured. During CAL3 the 15 dB attenuator is measured, and during CAL 4, the second 15 dB attenuator is measured. When the CAL4 message disappears, the calibration is completed.

3-37. SELECTION OF SIDEBAND PARAMETERS

When using Test Configurations 2 through 6, external downconversion is performed and a sideband parameter must be selected. Double sideband can be selected only in Test Configurations 2 and 4. Single sideband, either upper or lower, can be selected in Test Configurations 2 through 6.

Speaking generally, double sideband measurements are less accurate than single sideband measurements. However, if the total overall gain of the Device Under Test is 20 dB or greater, inaccuracy of double sideband measurements due to noise in the second sideband is not significant. Also, accuracy of double sideband measurements can be increased by using a low frequency IF so that the two sidebands are closer together in frequency. This reduces the differences in noise level from sideband to sideband, and improves accuracy.

During single sideband measurements, a high-pass, low-pass, or band-pass filter must be used to reject noise at unwanted image frequencies. Otherwise, noise from the image band, as well as noise from the RF measurement band, would be downconverted to the same IF band. Generally, the Device Under Test will have a different response in the RF measurement and image bands, and the actual measurement then becomes an average of the two unequal responses when no filter is used.

For a lower sideband measurement, a low-pass filter is used. For an upper sideband measurement, a high-pass filter is used. Because a low-pass filter rejects all frequencies and harmonics above its cutoff frequency, lower sideband measurements may be preferred to upper sideband. It should be noted that where a single sideband measurement is made and a filter with the needed cutoff frequency is not available, gain compensation can be used to correct for the error due to noise from the unwanted image sideband. (See Paragraph 3-40 on page 3-86.)

The width of the RF measurement range determines if measurements can be made using single or double sideband. As indicated in Table 3-4, Selecting the Test Configuration, measurements taken over an RF range wider than 1.6 GHz must be made double sideband, and Test Configuration 2 or 4 must be used. This 1.6 GHz figure is somewhat arbitrary, but it is based on the practical problem of finding a filter with the correct cutoff frequency when making single sideband measurements. The following discussion will show how this problem affects the choice of test configuration and sideband parameters.

Figure 3-20 is an example of a measurement situation using Test Configuration 3. As shown in Table 3-4, this configuration requires a fixed frequency local oscillator which produces a variable frequency IF. Measurements are made over an RF range less than 1.6 GHz wide, and therefore a single sideband parameter is chosen. In this case, lower single sideband is used.

1. Measurements are desired from 3.7 GHz to 4.2 GHz. The RF range is 500 MHz wide.
2. The local oscillator frequency remains fixed at 5.2 GHz.
3. IF frequencies vary from 1.5 GHz to 1.0 GHz. (5.2 - 3.7 = 1.5 GHz) to (5.2 - 4.2 = 1.0 GHz)
4. Unfiltered image frequencies will fold into the IF frequencies. (6.7 - 5.2 = 1.5 GHz) to (6.2 - 5.2 = 1.0 GHz)
5. To obtain accurate measurements a low-pass filter is used to filter out the image frequencies. The cutoff frequency of the filter must be between 4.2 GHz and 6.2 GHz. It would be relatively easy to find a filter with a cutoff frequency in this range since it is 2000 MHz wide. It should be noted that the filter must not roll-off below 4.2 GHz and it should achieve 40 dB or more of rejection by 6.2 GHz.
6. It is sound engineering practice to also provide isolation between the DUT and the mixer. This prevents mixer products and local oscillator leakage through the mixer from interacting with the DUT. To accomplish this, the low-pass filter cutoff frequency must be between 4.2 GHz and 5.2 GHz, a 1000 MHz range. Thus, it is slightly more difficult to find the right filter.
7. Go to the next example to see how increasing the width of the RF measurement range increases this problem.

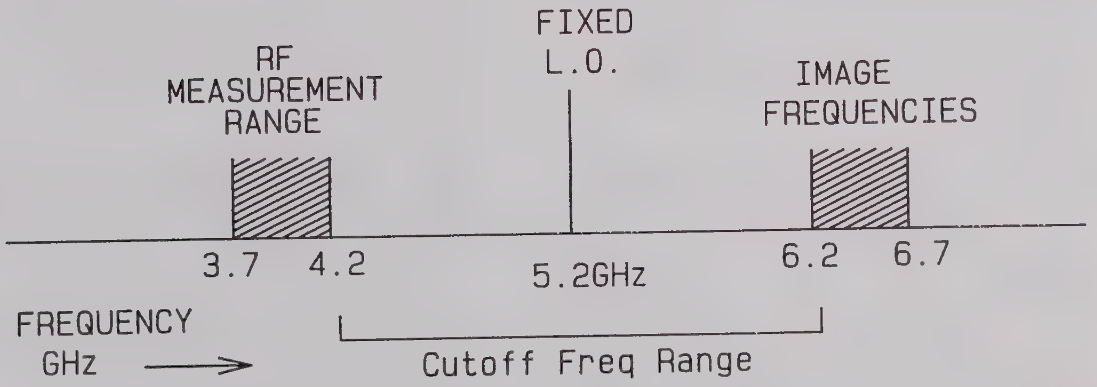


Figure 3-20. EXAMPLE 1 - SIDEBAND SELECTION

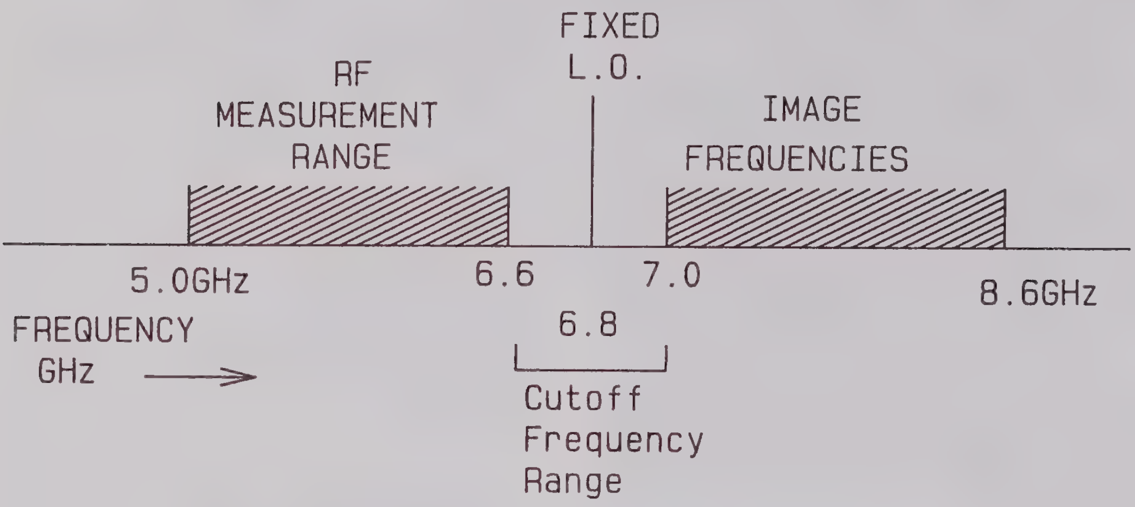


Figure 3-21. EXAMPLE 2 - SIDEBAND SELECTION

Figure 3-21 also shows an example using Test Configuration 3. Again, a fixed frequency local oscillator is used to produce a variable IF. Single lower sideband is used. However, the RF measurement range is expanded to 1.6 GHz width.

1. Measurements are desired from 5.0 GHz to 6.6 GHz. The RF measurement range is 1.6 GHz wide.
2. The local oscillator frequency remains fixed at 6.8 GHz.
3. IF frequencies vary from 1.8 GHz to 0.2 GHz. (6.8 - 5.0 = 1.8 GHz) to (6.8 - 6.6 = 0.2 GHz)
4. Unfiltered image frequencies will fold into the IF frequencies.
   (8.6 - 6.8 = 1.8 GHz) to (7.0 - 6.8 = 0.2 GHz)
5. To obtain accurate measurements a low-pass filter is needed to filter out the image frequencies. The cutoff frequency of the filter must be between 6.6 GHz and 7.0 GHz. It is much more difficult to find a filter with a cutoff frequency in this range since it is only 400 MHz wide. The filter must not roll-off below 6.6 GHz and it should achieve 40 dB or more of rejection by 7.0 GHz.
6. If the filter is to provide isolation between the DUT and the mixer, its cutoff frequency must fall between 6.6 MHz and 6.8 MHz. With this allowable range of only 200 MHz, it becomes very difficult to find the right filter.
7. One solution to this problem is to reduce the width of the RF measurement range and make two or more measurement sweeps. Another possibility is to make the measurement in double sideband mode using Test Configuration 2 or 4. A third alternative is to use Gain Compensation to correct for the additional noise from the unwanted sideband. (See Paragraph 3-40.)
8. Go to the next example to see how this problem is slightly different using Test Configuration 2 or 4.

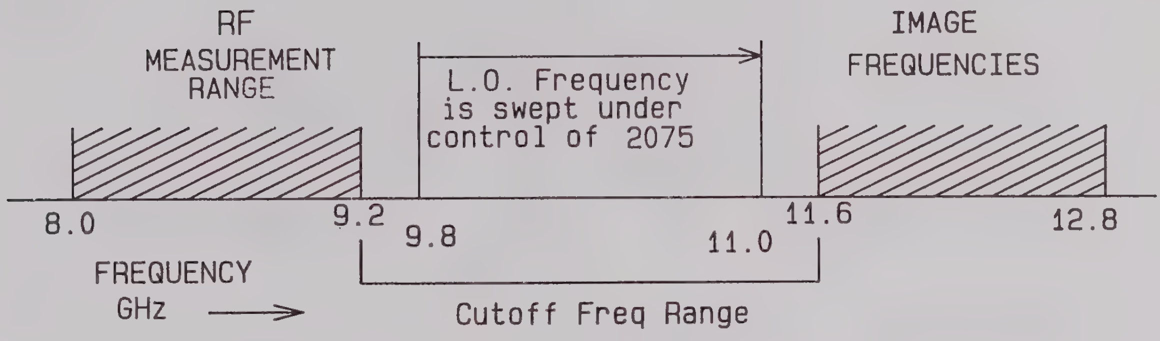

RF
MEASUREMENT
RANGE
L.O. Frequency
is swept under
control of 2075
IMAGE
FREQUENCIES
8.0
9.2
9.8
11.0
11.6
12.8
FREQUENCY
GHz
Cutoff Freq Range

Figure 3-22. EXAMPLE 3 - SIDEBAND SELECTION

Figure 3-22 is an example of a test situation using Test Configuration 2.

As shown in Table 3-4, this configuration requires a variable frequency local oscillator and produces a fixed frequency IF. Measurements are made over an RF range less than 1.6 GHz wide, and therefore a single sideband parameter is chosen. In this case, lower sideband is used.

1. Measurements are desired from 8.0 GHz to 9.2 GHz. The RF range is 1.2 GHz wide.

2. The local oscillator frequency is varied from 9.8 GHz to 11.0 GHz.

3. The IF frequency is fixed at 1.8 GHz.
   (9.8 - 8.0 = 1.8 GHz) to (11.0 - 9.2 = 1.8 GHz)

4. Unfiltered image frequencies will fold into the IF frequencies.
   (11.6 - 9.8 = 1.8 GHz) to (12.8 - 11.0 = 1.8 GHz)

5. To obtain accurate measurements a low-pass filter must be used to filter out the image frequencies. The cutoff frequency of the low-pass filter must be between 9.2 GHz and 11.6 GHz. It is relatively easy to find a filter having a cutoff frequency within this range since it is 2.4 GHz wide. Again, however, to isolate the DUT from mixer products would require that the filter cutoff frequency be between 9.2 and 9.8 GHz, a range of only 600 MHz.

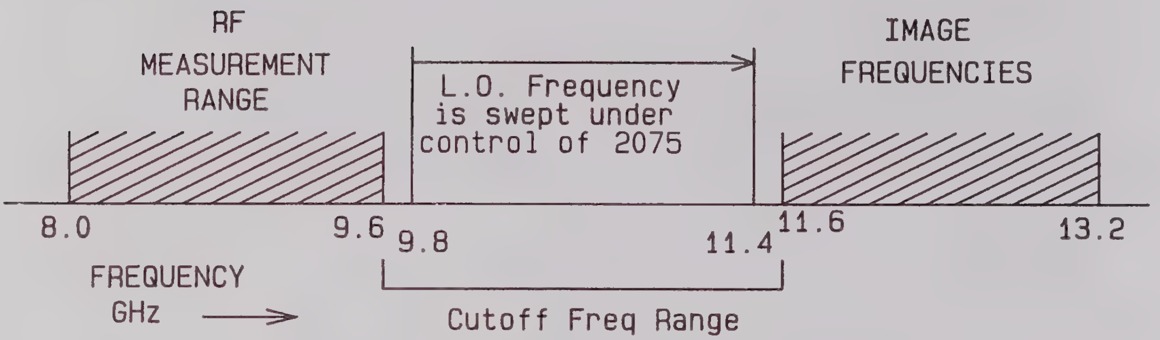


Figure 3-23. EXAMPLE 4 - SIDEBAND SELECTION

Figure 3-23 is an example of a test situation using Test Configuration 2. Again, this configuration requires a variable frequency local oscillator and produces a fixed frequency IF. In the case below, measurements are made over an RF range which is 1.6 GHz wide, and a single sideband parameter is chosen.

1. Measurements are desired from 8.0 GHz to 9.6 GHz. The RF range is 1.6 GHz wide.
2. The local oscillator frequency is varied from 9.8 GHz to 11.4 GHz.
3. The IF frequency is fixed at 1.8 GHz.
   (9.8 - 8.0 = 1.8 GHz) to (11.4 - 9.6 = 1.8 GHz)
4. Unfiltered image frequencies will fold into the IF frequencies.
   (11.6 - 9.8 = 1.8 GHz) to (13.2 - 11.4 = 1.8 GHz)
5. A low-pass filter is used to filter out the image frequencies. The cutoff frequency of the filter must fall between 9.6 and 11.6 GHz, a range of 2000 MHz. If local oscillator leakage and mixer products are to be isolated from the DUT, the filter cutoff frequency would have to fall between 9.6 and 9.8 MHz, a range of only 200 MHz. Thus it can be seen how increasing the RF measurement range increases the difficulty of obtaining a filter with the correct cutoff frequency. One solution to this problem is to decrease the RF measurement range and make several swept measurements. Another solution is to make a double sideband measurement using test configuration 2 or 4. Another solution is to use gain compensation to correct for the additional noise from the unwanted sideband. See Paragraph 3-40.
6. These are only four examples. Depending on the RF frequencies of measurement, the IF frequencies, and the test configuration used, the situation will vary. This is why the 1.6 GHz figure for maximum RF range of single sideband measurements is somewhat arbitrary, but may be useful as a practical limit.

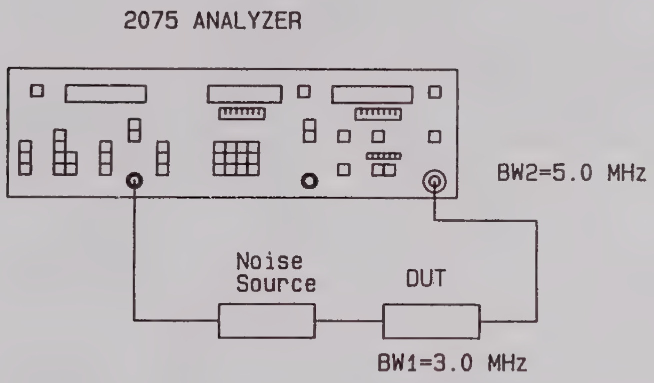


Figure 3-24. BANDWIDTH COMPENSATION - EXAMPLE 1

3-38. BANDWIDTH COMPENSATION

If the noise bandwidth of the Device Under Test (First Stage) is narrower than the noise bandwidth of the Second Stage, bandwidth compensation should be employed to ensure measurement accuracy. However, it should be employed only if the Gain of the Device Under Test is greater than Unity.

The term FIRST STAGE refers only to the Device Under Test. The term SECOND STAGE refers to the 2075 and any other RF devices which are part of the measurement system, excluding the DUT.

If the bandwidth of the DUT is wider than or equal to the bandwidth of the Second Stage, then no bandwidth compensation is needed. In such a case, Special Function 4.0 should be selected. This selects no bandwidth compensation and uses default values of 5.0 MHz for each bandwidth.

The nominal bandwidth of the 2075 is 5.0 MHz and this is usually the bandwidth of the Second Stage. However, where external amplifiers or mixers are used as part of the Second Stage, and one of these has a bandwidth narrower than 5.0 MHz, this narrower bandwidth is the bandwidth of the Second Stage. For example, if an external mixer is used as part of the Second Stage, and its IF bandwidth is 3.1 MHz, the Second Stage bandwidth is considered to be 3.1 MHz.

The examples given illustrate several cases.

In this first example, the BW of the First Stage is 3.0 MHz and the BW of the Second Stage is 5.0 MHz. Employ BW compensation by entering:

SPEC FUNC 4.1 ENTER

3.0 ENTER

SPEC FUNC 4.2 ENTER

5.0 ENTER

SPEC FUNC 4.3 ENTER

(Turns on BW Compensation)

Notice that Special Function 4.1 is used to enter the First Stage BW (BW1) and 4.2 is used to enter the Second Stage BW (BW2). When BW compensation is used, follow the normal procedures as given for the different test configurations, but make the entries before performing Second Stage Calibration.

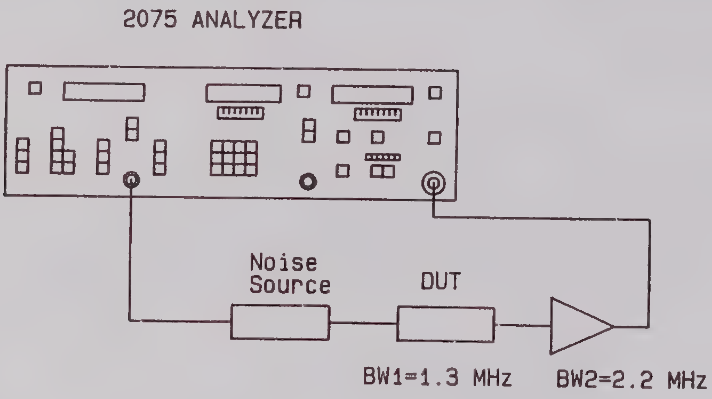


Figure 3-25. BANDWIDTH COMPENSATION - EXAMPLE 2

In this second example the BW of the First Stage (DUT) is 1.3 MHz and the smallest bandwidth of the Second Stage (the amplifier) is 2.2 MHz. Make the entries as follows:

SPEC FUNC 4.1 ENTER
1.3 ENTER

SPEC FUNC 4.2 ENTER
2.2 ENTER

SPEC FUNC 4.3

(To turn on BW compensation)

The GPIB code for Special Function 4.1 is N1.
The GPIB code for Special Function 4.2 is N2.
The GPIB code for Special Function 4.3 is N3.

Because, where BW compensation is required, the accuracy of measurements depends on how accurately BW1 and BW2 are known, the actual bandwidths should be measured before entry into the 2075. If the bandwidth of the DUT is not known, the procedures given in Paragraph 3-39 can be used to determine the ratio of the bandwidths. It is actually more important to know the correct ratio than it is to know the exact value for each.

Where the bandwidth of the DUT is known to be less than 5.0 MHz (the nominal value of the 2075) it is possible to eliminate the need for bandwidth compensation by employing an alternate scheme. This scheme is accomplished by adding a narrow band-pass filter to the Second Stage. The bandwidth of the filter must be less than the bandwidth of the DUT. This makes the First Stage BW wider than the Second Stage BW. It thereby eliminates the need to use BW compensation and eliminates the need to know the precise bandwidths of the two stages. Where this method is used, enter Special Function 4.0 (no bandwidth compensation) and the nominal default values of 5.0 MHz will be used for the first and Second Stage bandwidths.

3-39. DETERMINING THE BANDWIDTH RATIO OF THE FIRST AND SECOND STAGES

When the noise bandwidth of the First Stage is narrower than the noise bandwidth of Second Stage, bandwidth compensation must be employed to improve the accuracy of measurements. (Refer to Paragraph 3-38 on page 3-82.)

For improved accuracy it is actually more important to know the ratio of the First Stage to Second Stage bandwidth than it is to know the precise bandwidth for each. The following procedure shows how to determine this bandwidth ratio when the nominal value of 5.0 MHz is used for the Second Stage BW. It consists of:

A. Measuring the insertion loss or gain of the DUT using a power meter.

B. Measuring the insertion loss or gain of the DUT using the 2075.

C. Calculating the bandwidth ratio.

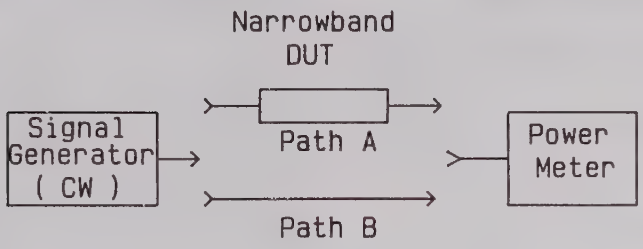


Figure 3-26. INSERTION LOSS MEASUREMENT WITH POWER METER

To measure the insertion loss or gain of the DUT using a power meter perform the following steps:

1. Connect the DUT between the signal generator and the power meter as shown in Path A of Figure 3-26 below.
2. Tune the CW signal generator to obtain a peak reading on the power meter. Record the frequency that gives the peak reading.
3. Adjust the level of the CW signal generator to set a convenient reference level on the power meter. Record this level.
4. Remove the DUT from the setup.
5. Connect the CW signal generator directly to the power meter as shown in Path B of Figure 3-26 above.
6. Note the change in level on the power meter. The amount of increase over that noted in Step 3 is the insertion loss of the DUT. If the power meter reading decreases from that noted in Step 3, the decrease is the insertion gain of the DUT.

To measure the insertion loss or gain of the DUT using the 2075 perform the following steps:

7. Connect the noise source to the input of the 2075 as shown in Path A of Figure 3-27 below.
8. Set the Start and Stop frequencies 4 MHz above and 4 MHz below the frequency recorded in Step 2 above. Use a Step Size of .1 MHz and enter Special Function 9.1 to enable display resolution of .1 MHz.
9. Press the **CALIB** key to perform a Second Stage Calibration. Use sufficient smoothing to produce accurate results.
10. After the calibration is complete, connect the DUT as shown in Path B of Figure 3-27 below.
11. Tune the 2075 to the frequency which produces the highest gain, or the least loss. This will be the same frequency that was recorded in Step 2. Measure the Gain by pressing **F + G**.
12. Record the gain as indicated in Window B of the 2075.

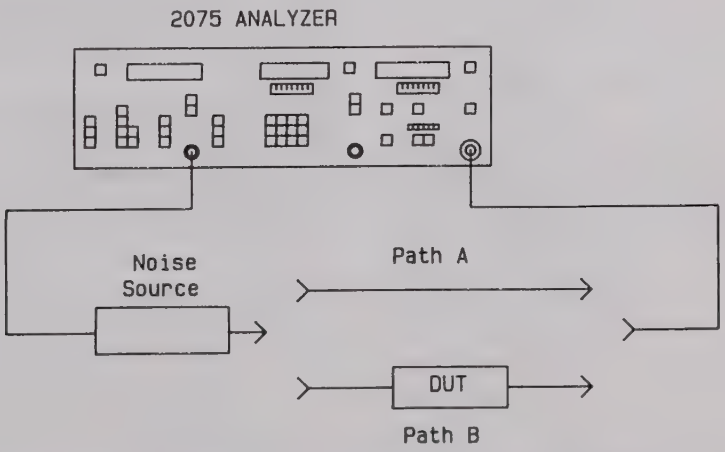


Figure 3-27. INSERTION LOSS MEASUREMENT WITH 2075

To calculate the bandwidth ratio of the First Stage to the Second Stage use the following equations:

GP = Gain or loss measured with the power meter (Step 6)

GN = Gain or loss measured using the 2075 (Step 12)

BL = Bandwidth loss
(loss due to bandwidth reduction)

$GN - GP = BL$ and

$10^{\left(\frac{BL}{10}\right)}$ = The bandwidth of the DUT versus the bandwidth of the 2075.

Example 1

$GP = 25$ dB
$GN = 19$ dB (Gain)

$GN - GP = BL$
$19 - 25 = -6$ dB and $10^{\left(\frac{-6}{10}\right)} = .251$

The bandwidth of the DUT is .251 of the 2075 bandwidth.

In Example 1 above, the value for the First Stage bandwidth would be entered as 1.25 MHz (.251 x 5.0MHz). This would be accomplished by pressing:

SPEC FUNC 4.1 ENTER

1.25 ENTER

Example 2

$GP = -3$ dB
$GN = -7$ dB (loss)

$GN - GP = BL$
$-7 - (-3) = -4$ dB and $10^{\left(\frac{-4}{10}\right)} = .398$

The bandwidth of the DUT is .398 of the 2075 bandwidth.

In Example 2 above, the value for the First Stage bandwidth would be entered as 1.99 MHz (.398 x 5.0 MHz). This would be accomplished by pressing:

SPEC FUNC 4.1 ENTER

1.99 ENTER

In both examples, the nominal or default value of 5.0 MHz would be used for the bandwidth of the 2075.

3-40. COMPENSATION FOR LOSS OR GAIN

The 2075 provides a means of compensating for known losses (or gains). Loss 1 is a loss between the noise source and the Device Under Test. Loss 2 is a loss between the Device Under Test and the 2075. Typically such losses are due to test cables or other devices which are part of the First Stage and, therefore, are not in the setup during Second Stage Calibration.

When the values for Loss 1 and Loss 2 are entered, a single temperature for both losses is also entered. Loss 1 and Loss 2 are considered to have the same temperature, which is the ambient temperature of the test area. The temperature can be entered in kelvins, degrees Fahrenheit, or degrees Centigrade. If no values are entered, default values of 296.0 K for the temperature and 0 dB for the losses are assumed. Compensation can be made for only one loss (or gain), instead of two, where desired.

A negative loss equates to a gain. When compensating for a gain instead of a loss, enter a minus (-) sign before the numeric value. Only Loss 1 can be entered as a minus value (gain).

Special Functions 17 and 18 are used to enter the loss compensation parameters. The following table shows the various functions:

DESCRIPTION	SPECIAL FUNCTION	GPIB CODE
No Loss Compensation (OFF)	17.0	NS
Use Loss Compensation (ON)	17.1	L0
Enter Loss 1 (between NS and DUT)	18.1	L1
Enter Temperature For Loss 1 and 2	18.2	L2
Enter Loss 2 (between DUT and 2075)	18.3	L3

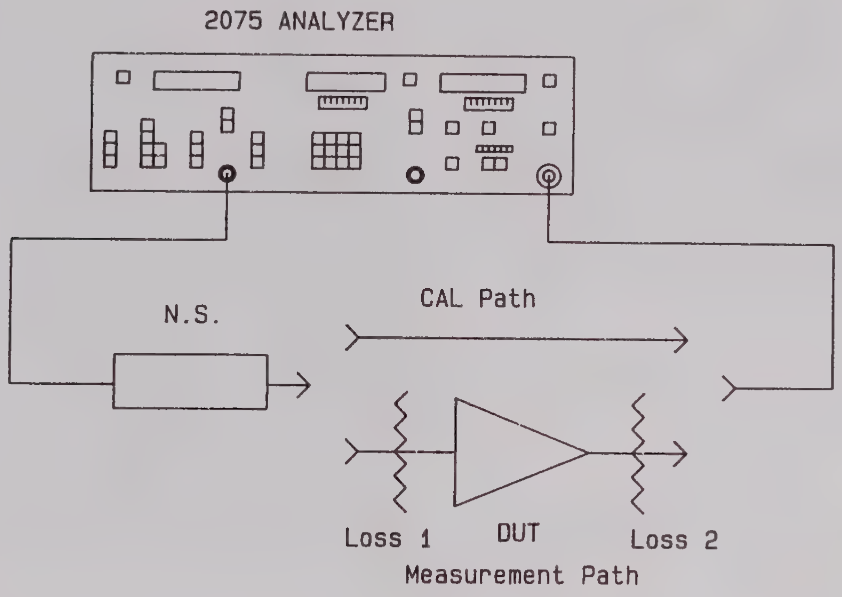


Figure 3-28. LOSS COMPENSATION

After the loss compensation parameters have been entered, all subsequent measurements will use the programmed values. Entering Special Function 17.0 will turn off the loss compensation. However the values of Loss 1, Loss 2, and the temperature, are saved and will be reused when loss compensation is used again by entering Special Function 17.1.

The example above shows the procedure for employing loss compensation.

The Device Under Test is an amplifier which has a loss of 3.03 dB in series with its input (Loss 1) and a loss of 6.11 dB in series with its output (Loss 2). The ambient temperature is 298.0 kelvins.

The measurement procedure does not change from those given in the test configuration procedures of Paragraphs 3-11 through 3-19. The only difference is that the following entries are made before the Second Stage Calibration is performed.

1. To turn on Loss Compensation, press:

   SPEC FUNC   17.1   ENTER

2. To enter Loss 1, press:

   SPEC FUNC   18.1   ENTER

   3.03   ENTER

3. To enter the temperature of the losses, press:

   SPEC FUNC   18.2   ENTER

   298.0   ENTER

The temperature can be entered as kelvins, degrees Centigrade, or degrees Fahrenheit, using Special Function 12. When set to the default value of 12.0, the entry must be made in kelvins. Special Function 12.1 allows entry in degrees C, and Special Function 12.2 allows entry in degrees F. The 2075 will also convert from one scale to another. Simply make the entry using the correct special function and then change the special function to the scale desired for display. For example, to enter 22 degrees C and then convert to F press:

SPEC FUNC 12.1 ENTER

(set to Centigrade)

SPEC FUNC 18.2 ENTER

22 ENTER

(enter loss temperature)

SPEC FUNC 12.2 ENTER

(set to Fahrenheit)

4. To enter Loss 2 press:

SPEC FUNC 18.3 ENTER

6.11 ENTER

Then proceed normally by performing the Second Stage Calibration. The 2075 automatically turns off loss compensation while performing the Second Stage Calibration and then turns it on again when the calibration is completed.

When loss compensation is no longer desired, turn it off by entering:

SPEC FUNC 17.0 ENTER

Gain compensation is also useful where double sideband measurements are made because a filter with the needed cutoff frequency cannot be obtained for a single sideband measurement. In Test Configuration 4, where the DUT is a mixer, there are no sidebands during Second Stage Calibration because the mixer is not in the setup. That is, the 2075 is using single sideband for the calibration, but makes the measurement using double sideband. In such a case, enter a value of -3 for Loss 1. The 2075 will compensate for the additional unwanted noise power from the unwanted sideband when making the measurement. (This increases accuracy, assuming that the frequency response of the DUT is the same for both sidebands.)

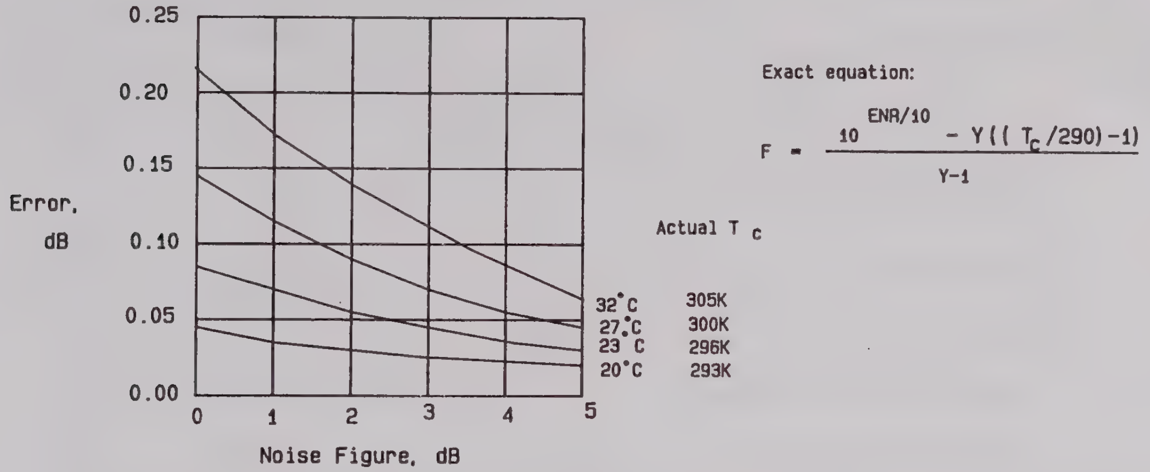
3-41. T_{cold} COMPENSATION

T_{cold} is the OFF temperature of the noise source. It is also the ambient temperature of the test area where the measurements are being made when the noise source is a solid state unit, such as one of the Eaton 76 Series.

The default value of T_{cold} is 296.0 kelvins (23.5 ° C) when the 2075 is PRESET or RESET. When the 2075 is powered-on, T_{cold} is set to whatever previous value has been entered. While this temperature is likely to be close to the actual room temperature, accuracy can be increased by measuring and then entering the actual ambient temperature.

The level of measurement error increases as the actual value of T_{cold} deviates from 296.0 kelvins, and as the value of Noise Figure is reduced.

The following graph shows the increase in error as the actual value of T_{cold} deviates from 290 kelvins. (The graph assumes a stored value of 290 kelvins and a noise source ENR of about 15.3 dB.)



$$F = \frac{10^{ENR/10} - Y((T_c/290)-1)}{Y-1}$$

Figure 3-29. ERROR CAUSED BY T_{COLD} DEVIATION FROM 290 K

To enter the true value of T_{cold}, for example 294.0 kelvins, press:

SHIFT ON/OFF 294.0 ENTER

The value for T_{cold} can be entered in units of kelvins, degrees C or degrees F by selecting the correct setting of Special Function 12.

Special Function 12.0 allows entry in kelvins. This is the default state.
Special Function 12.1 allows entry in degrees Centigrade.
Special Function 12.2 allows entry in degrees Fahrenheit.

Simply set Special Function 12 to the appropriate value before making the temperature entry.

The GPIB code for T_{cold} is TC.

In the above graph, the degree of error is derived for the following equations:

The inexact equation is $F = \dfrac{\dfrac{Th - 290\text{ K}}{290\text{ K}}}{Y - 1}$

The exact equation is $F = \dfrac{\left[\dfrac{Th - 290\text{ K}}{290\text{ K}}\right] - Y\left[\dfrac{Tc}{290\text{ K}} - 1\right]}{Y - 1}$

3-42. OSCILLOSCOPES AND RECORDERS TO DISPLAY DATA

The 2075 can output measurement data for display on an oscilloscope, an X-Y plotter, or a strip chart recorder. The setup procedures are similar for all three. Data can be output to only one device at a time.

Any noise-type measurement which the 2075 can make, or any gain measurement, can be displayed on any of these output devices. The units of display at the output device will be the same as those selected for display on the 2075 front panel.

Special Function 7 is used to select the type of device to display the data, as well as the type of display. Table 3-6 shows the different display functions available under Special Function 7.

Table 3-6. Output Display Special Functions

DISPLAY DEVICE	DATA DISPLAYED	SPECIAL FUNCTION	GPIB CODE
SCOPE			
	Display Noise Data and Gain vs. Frequency (for F+G measurements) or Display Noise Data vs. Frequency (for F measurements)	7.0	NP
	Display Test Pattern #1	7.1	P1
	Display Test Pattern #2	7.2	P2
	Display Noise Data vs. Frequency	7.3	NQ
	Display Gain vs. Frequency	7.4	AQ
PLOTTER			
	Position Pen at Lower Left	7.5	LL
	Position Pen at Upper Right	7.6	UR
	Plot Noise Data vs. Frequency	7.7	FQ
	Plot Gain vs. Frequency	7.8	GQ
STRIP CHART			
	Noise Data from X Output and Gain from Y Output	7.9	FG

When the 2075 is powered-up or RESET, Special Function 7 is set to 7.2. When a sweep is started, the instrument changes to Special Function 7.0 unless some other state of Special Function 7 has been selected.

The procedure for setting up the 2075 to output data for display is quite simple. It consists of entering upper and lower limits for Noise Figure and Gain, connecting the display device, and adjusting its controls.

The **LOWER LIMIT** and **UPPER LIMIT** keys are used to enter the limits for noise and gain measurements. The non-shifted mode is used for entering noise measurement limits and the shifted function is used for setting Gain limits. The allowable range for noise measurements is -30 through 9999. The allowable range for Gain is -30.0 through 80.0. After these limits are entered the 2075 will scale the display output accordingly and fit the measurement data on that scale.

The following three example procedures are given for setting up an oscilloscope, an X-Y plotter, and a strip chart recorder.

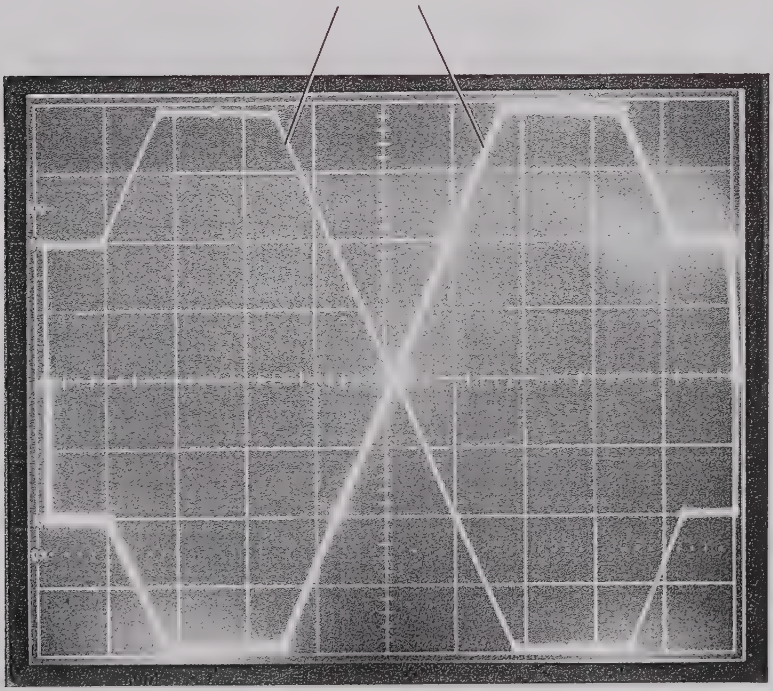
Output to an Oscilloscope

1. Connect the X-AXIS, Y-AXIS, and Z-AXIS rear panel outputs of the 2075 to the A, B, and Z (horizontal, vertical, and Z) inputs of the oscilloscope. Use DC coupling for the oscilloscope inputs. The oscilloscope should use a positive-going TTL level voltage for blanking from the Z input.

2. Press:

   SPEC FUNC | 7.2 | ENTER

   This will cause the 2075 to output test pattern #2 (shown below) to the oscilloscope. Adjust the scope input sensitivity controls so that the test pattern just touches the screen edges on all four sides. The top and bottom edges should overlay the top and bottom scalar lines on the scope screen so that vertical scaling will be accurate. Verify that the pattern's diagonal lines cross near the center of the screen. Adjust the INT (Intensity) control on the rear panel of the 2075 to obtain a perceptible difference in intensity between the two halves of the test pattern.



Adjust the INTENSITY Control on the 2075 rear panel to obtain a perceptible difference in intensity between the two halves of the pattern.

Figure 3-30. TEST PATTERN 2 OSCILLOSCOPE DISPLAY

3. Enter the noise measurement lower limit (in this example, 0 dB) by pressing:

   LOWER LIMIT 0 ENTER

   When the first key is pressed, the current programmed value is displayed in Window C.

4. Enter the noise measurement upper limit (in this example, 6 dB) by pressing:

   UPPER LIMIT 6 ENTER

5. Enter the Gain lower limit (in this example, 0 dB) by pressing:

   SHIFT LOWER LIMIT 0 ENTER

6. Enter the Gain upper limit (in this example, 40 dB) by pressing:

   SHIFT UPPER LIMIT 40 ENTER

7. Make the measurement by pressing **SWEEP**. The data will be displayed on the oscillscope as the 2075 makes continuous automatic sweeps.

The figure below is a typical oscilloscope display using Special Function 7.0. Notice that one trace is fainter than the other. When Noise Figure and Gain are displayed simultaneously, the Noise Figure trace is more intense.

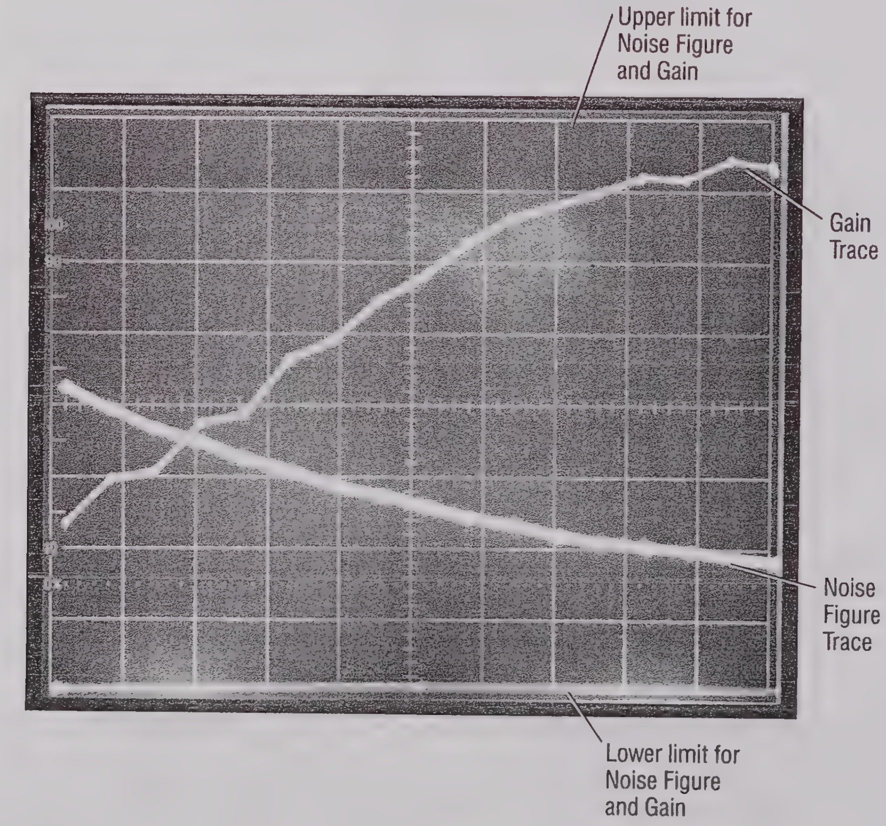

Upper limit for Noise Figure and Gain
Gain Trace
Noise Figure Trace
Lower limit for Noise Figure and Gain

Figure 3-31. NOISE FIGURE AND GAIN OSCILLOSCOPE DISPLAY

The upper and lower limits in the diagram apply to both the noise measurement and the gain measurements respectively.

As the noise measurement is stepped through the selected frequency range, the oscilloscope will emphasize the current frequency point by increasing the intensity of the corresponding dot on the CRT. This allows the observer to keep track of the measurement frequency by correlating the CRT trace with the frequency displayed on the 2075 front panel. The maximum number of dots which can be output to the scope is 256. When a swept measurement is made using more than 255 frequency steps, the 2075 automatically compresses the data to fit the space on the scope display and each dot may represent more than one data point.

When a swept measurement is made using less than 255 frequency steps, the number of segments on the scope display will be equal to the number of frequency steps.

If the step size is such that there is not an integral number of steps from the start to the stop frequency, the last frequency step will be fractional. For example, when sweeping from 400 MHz to 600 MHz, with a step size of 30 MHz, the last frequency step would be 20 MHz (580 to 600 MHz). In such a case, this last frequency step will be displayed as a full segment on the oscilloscope.

Output to an X-Y Plotter

When measurement data is output to an X-Y plotter, swept measurements must be made using 256 frequency steps or less. Otherwise, the 2075 will not output the data.

1. Connect the X-AXIS, Y-AXIS, and Z-AXIS outputs on the rear panel to the X, Y, and pen-lift inputs of the X-Y plotter. Use DC mode for the X and Y inputs. Make certain, however, that the pen-lift input is TTL compatible (0 - 5 volt input).
2. Enter the noise measurement lower limit (in this example, 0 dB) by pressing:

   LOWER LIMIT   0   ENTER

   When the first key is pressed, the current programmed value is displayed in Window C.
3. Enter the noise measurement upper limit (in this example, 6 dB) by pressing:

   UPPER LIMIT   6   ENTER
4. Enter the Gain lower limit (in this example, 0 dB) by pressing:

   SHIFT   LOWER LIMIT   0   ENTER
5. Enter the Gain upper limit (in this example, 40 dB) by pressing:

   SHIFT   UPPER LIMIT   40   ENTER
6. Press:

   SPEC FUNC   7.5   ENTER

   The 2075 will output the lower left alignment point to the plotter. Adjust the plotter sensitivity controls to position the pen on the lower left corner of the paper.
7. Press:

   SPEC FUNC   7.6   ENTER

   The 2075 will output the upper right alignment point to the plotter. Adjust the plotter sensitivity controls to position the pen on the upper right corner of the paper.
8. Repeat and recheck Steps 6 and 7 as necessary.
9. Choose the measurement to be displayed. Press:

   SPEC FUNC   7.7   ENTER

   to plot noise data versus frequency, OR

Press:

SPEC FUNC 7.8 ENTER

to plot Gain versus frequency.

Both of these can be plotted on the same chart by plotting one first and then selecting the other and plotting it. The pen color should be changed between plots.

10. To make the measurement and plot the trace, press:

SHIFT SWEEP

The 2075 will execute a single sweep and plot a single trace. It should be noted that if an attempt is made to initiate continuous automatic sweeps, by pressing only **SWEEP** the 2075 will sweep but not plot.

Output to a Strip Chart Recorder

1. Connect the 2075 X-AXIS and Y-AXIS outputs to the Channel 1 and Channel 2 inputs on the strip chart recorder. Noise measurements will be output on the X-AXIS and Gain will be output on the Y-AXIS.

2. Enter the noise measurement lower limit (in this example, 0 dB) by pressing:

LOWER LIMIT 0 ENTER

When the first key is pressed, the current programmed value is displayed in Window C.

3. Enter the noise measurement upper limit (in this example, 6 dB) by pressing:

UPPER LIMIT 6 ENTER

4. Enter the Gain lower limit (in this example, 0 dB) by pressing:

SHIFT LOWER LIMIT 0 ENTER

5. Enter the Gain upper limit (in this example, 40 dB) by pressing:

SHIFT UPPER LIMIT 40 ENTER

6. Press:

SPEC FUNC 7.5 ENTER

The 2075 will output the lower limit alignment point to both channels. Adjust the sensitivity controls on both channels of the strip chart recorder to position the pens at the bottoms of the charts.

7. Press:

SPEC FUNC 7.6 ENTER

The 2075 will output the upper limit alignment point to both channels. Adjust the sensitivity controls on both channels to position the pens at the tops of the charts.

8. Repeat and recheck Steps 6 and 7 as necessary.

9. Press:

SPEC FUNC 7.9 ENTER

This selects output to a strip chart recorder. Noise measurements will be plotted on Channel 1 (X-AXIS output) and Gain will be plotted on Channel 2 (Y-AXIS output).

10. Where Fixed Frequency measurements are made, the strip chart recorder will plot the readings versus time.

11. It is possible to plot swept measurements also. These are made against frequency, however, the frequency is plotted as time on the strip chart. It should be noted that the 2075 does not always take the same amount of time for each measurement at each frequency step. Therefore, it is not possible to correlate frequency with time.

12. Press the appropriate key on the 2075 to make the measurement.

3-43. SELECTING AN EXTERNAL LOCAL OSCILLATOR

In Test Configurations 2 through 6 the user must supply an external local oscillator for use in downconverting the DUT frequencies to frequencies within the input range of the 2075 (unless the DUT is a receiver with a built-in local oscillator and an IF lower than 1850 MHz). Care must be exercised when selecting an external local oscillator. A suitable signal generator must have the following characteristics:

1. Sufficient output power to drive the mixer into efficient operation.

2. The appropriate frequency range needed for downconversion to the allowable 2075 input frequency range.

3. Good frequency accuracy and repeatability. The degree of accuracy required depends on the measurement. For example, for a noise measurement made at the band edge of an amplifier that has steep skirts, a 5 MHz frequency error may be significant. Some generators can be locked to an external frequency counter to improve accuracy.

4. Low noise ouput, i.e. low phase noise and low floor noise with very low spurious output. Special care must be taken concerning this point. Heterodyne signal generators may be unsuitable. Some so-called synthesizing signal generators switch to a heterodyning process below 2.0 or 2.5 GHz. Cavity stabilized klystrons produce the cleanest signals but are cumbersome and are not GPIB programmable. Direct synthesizers are not desirable because of their relatively high floor noise. Indirect synthesizers, such as the Eaton 5440, are good. Ultimately, the only way to be certain that a device is a suitable external local oscillator is to try it.

5. GPIB compatibility where required. (Test Configurations 3 and 5 do not require a GPIB compatible local oscillator.)

3-44. CONTROLLING EXTERNAL LOCAL OSCILLATORS

In the LIMITED CONTROLLER mode, the 2075 can control an external sweep generator which is used as an external local oscillator in Test Configurations 2 through 6. Control programs for three commonly available sweep generators are stored in ROM memory. Table 3-7 below lists these devices and shows the special function which selects the control program for each one. The 2075 also allows the user to write a custom control program for a sweep generator other than those shown.

Table 3-7. Control Programs for External Local Oscillator

EXTERNAL LOCAL OSCILLATOR	SPECIAL FUNCTION
Hewlett Packard 8672	47.0
Wiltron 6600	47.1
Not used	47.2
Hewlett Packard 8350A	47.3
Custom Program	47.4

To select the control program for a Wiltron 6600, press:

SPEC FUNC 47.1 ENTER

The procedures for writing a custom program are presented in the next paragraph.

3-45. WRITING A CUSTOM PROGRAM FOR CONTROLLING A LOCAL OSCILLATOR

The 2075 allows the user to write a custom program for controlling an external local oscillator. The custom program is written into a 40 byte scratch pad in the instrument's RAM.

Instructions are entered in numeric form using the numeric keypad. Each instruction code is entered as the decimal numeric code equivalent for the desired ASCII character. The instructions are entered one byte at a time. As each byte is entered, its decimal form is displayed in Window A on the front panel.

The ASCII characters and their equivalent decimal forms are given in Table 3-8, US ASCII Character Codes. This table is located at the end of this subsection.

The general procedure for writing and executing a control program is shown below. Following that is a detailed sample procedure showing how to write and execute a control program for a Hewlett Packard 8673.

The general procedure is as follows:

1. Enter Special Function 48.1 to activate the user defined control program entry mode.
2. Enter the FREQUENCY PREFIX for the sweep generator by entering the decimal equivalents for the required ASCII characters.
3. Enter the ASCII character ACK (CNTRL-F) by entering the decimal equivalent for that ASCII character. (The decimal equivalent is 6.) When the program executes, the 2075 will insert the appropriate frequency, in MHz, in this location. [The ASCII character BEL (CNTRL-G) can be used to allow insertion of GHz instead of MHz.]
4. Enter the FREQUENCY TERMINATOR for the sweep generator by entering the decimal equivalents for the required ASCII characters.
5. Enter the OUTPUT POWER PREFIX for the sweep generator by entering the decimal equivalents for the required ASCII characters.
6. Enter the ASCII character SOH (CNTRL-A) by entering the decimal equivalent for that ASCII character. (The decimal equivalent is 1.) When the program executes, the 2075 will insert the output power level in this location.
7. Enter the OUTPUT POWER TERMINATOR for the sweep generator by entering the decimal equivalents for the required ASCII characters.
8. Enter the ASCII characters that disable all modulation and marker functions for that sweep generator by entering the decimal equivalents for those ASCII characters.
9. Enter the ASCII code to turn on the RF.
10. Terminate the program entry sequence.
11. Select the custom program as the desired controlling program.
12. Place the 2075 in the GPIB LIMITED CONTROLLER mode.

The following is a sample procedure illustrating the creation and execution of a custom program for controlling a Hewlett Packard 8673.

1. Activate the user defined control program entry mode by pressing:

   SPEC FUNC   48.1   ENTER

2. To enter the frequency prefix (FR), press:

   70   ENTER

   (this enters the ASCII F)

   82   ENTER

   (this enters the ASCII R)

3. To enter the ASCII character ACK (or CNTRL-F) press:

6 ENTER

4. To enter the frequency terminator (MZ) press:

77 ENTER

(this enters the ASCII M)

90 ENTER

(this enters the ASCII Z)

5. To enter the output power level prefix (PL) press:

80 ENTER

(this enters the ASCII P)

76 ENTER

(this enters the ASCII L)

6. To enter the ASCII character SOH (or CNTRL-A) press:

1 ENTER

7. To enter the output power level terminator (DM) press:

68 ENTER

(this enters the ASCII D)

77 ENTER

(this enters the ASCII M)

8. To enter the codes that disable amplitude modulation (AO) press:

65 ENTER

(this enters the ASCII A)

79 ENTER

(this enters the ASCII O)

9. To enter the codes that disable frequency modulation (DO) press:

68 ENTER

(this enters the ASCII D)

79 ENTER

(this enters the ASCII O)

10. To enter the codes that disable pulse modulation (PO) press:

80 ENTER

(this enters the ASCII P)

79 ENTER

(this enters the ASCII O)

11. To enter the codes that disable frequency markers (MO) press:

77 ENTER

(this enters the ASCII M)

79 ENTER

(this enters the ASCII O)

12. To enter the code that turns on the RF output (R1) press:

    82 ENTER

    (this enters the ASCII R)

    49 ENTER

    (this enters the ASCII 1)

13. To terminate the entry sequence press:

    ENTER

14. To select the custom program as the control program press:

    SPEC FUNC 47.4 ENTER

15. To put the the 2075 in the LIMITED CONTROLLER mode press:

    SPEC FUNC 40.2 ENTER

This concludes the procedure.

ASCII Char.	EQUIVALENT FORMS				GPIB
	Dec	Binary	Oct	Hex	
@	64	01000000	100	40	TA0
A	65	01000001	101	41	TA1
B	66	01000010	102	42	TA2
C	67	01000011	103	43	TA3
D	68	01000100	104	44	TA4
E	69	01000101	105	45	TA5
F	70	01000110	106	46	TA6
G	71	01000111	107	47	TA7
H	72	01001000	110	48	TA8
I	73	01001001	111	49	TA9
J	74	01001010	112	4A	TA10
K	75	01001011	113	4B	TA11
L	76	01001100	114	4C	TA12
M	77	01001101	115	4D	TA13
N	78	01001110	116	4E	TA14
O	79	01001111	117	4F	TA15
P	80	01010000	120	50	TA16
Q	81	01010001	121	51	TA17
R	82	01010010	122	52	TA18
S	83	01010011	123	53	TA19
T	84	01010100	124	54	TA20
U	85	01010101	125	55	TA21
V	86	01010110	126	56	TA22
W	87	01010111	127	57	TA23
X	88	01011000	130	58	TA24
Y	89	01011001	131	59	TA25
Z	90	01011010	132	5A	TA26
[	91	01011011	133	5B	TA27
\	92	01011100	134	5C	TA28
]	93	01011101	135	5D	TA29
^	94	01011110	136	5E	TA30
_	95	01011111	137	5F	UNT

ASCII Char.	EQUIVALENT FORMS				GPIB
	Dec	Binary	Oct	Hex	
`	96	01100000	140	60	SC0
a	97	01100001	141	61	SC1
b	98	01100010	142	62	SC2
c	99	01100011	143	63	SC3
d	100	01100100	144	64	SC4
e	101	01100101	145	65	SC5
f	102	01100110	146	66	SC6
g	103	01100111	147	67	SC7
h	104	01101000	150	68	SC8
i	105	01101001	151	69	SC9
j	106	01101010	152	6A	SC10
k	107	01101011	153	6B	SC11
l	108	01101100	154	6C	SC12
m	109	01101101	155	6D	SC13
n	110	01101110	156	6E	SC14
o	111	01101111	157	6F	SC15
p	112	01110000	160	70	SC16
q	113	01110001	161	71	SC17
r	114	01110010	162	72	SC18
s	115	01110011	163	73	SC19
t	116	01110100	164	74	SC20
u	117	01110101	165	75	SC21
v	118	01110110	166	76	SC22
w	119	01110111	167	77	SC23
x	120	01111000	170	78	SC24
y	121	01111001	171	79	SC25
z	122	01111010	172	7A	SC26
{	123	01111011	173	7B	SC27
|	124	01111100	174	7C	SC28
}	125	01111101	175	7D	SC29
~	126	01111110	176	7E	SC30
DEL	127	01111111	177	7F	SC31

Table 3-8. US ASCII Character Codes

ASCII Char.	EQUIVALENT FORMS				GPIB
	Dec	Binary	Oct	Hex	
NUL	0	00000000	000	00	
SOH	1	00000001	001	01	GTL
STX	2	00000010	002	02	
ETX	3	00000011	003	03	
EOT	4	00000100	004	04	SDC
ENQ	5	00000101	005	05	PPC
ACK	6	00000110	006	06	
BEL	7	00000111	007	07	
BS	8	00001000	010	08	GET
HT	9	00001001	011	09	TCT
LF	10	00001010	012	0A	
VT	11	00001011	013	0B	
FF	12	00001100	014	0C	
CR	13	00001101	015	0D	
SO	14	00001110	016	0E	
SI	15	00001111	017	0F	
DLE	16	00010000	020	10	
DC1	17	00010001	021	11	LLO
DC2	18	00010010	022	12	
DC3	19	00010011	023	13	
DC4	20	00010100	024	14	DCL
NAK	21	00010101	025	15	PPU
SYNC	22	00010110	026	16	
ETB	23	00010111	027	17	
CAN	24	00011000	030	18	SPE
EM	25	00011001	031	19	SPD
SUB	26	00011010	032	1A	
ESC	27	00011011	033	1B	
FS	28	00011100	034	1C	
GS	29	00011101	035	1D	
RS	30	00011110	036	1E	
US	31	00011111	037	1F	

ASCII Char.	EQUIVALENT FORMS				GPIB
	Dec	Binary	Oct	Hex	
space	32	00100000	040	20	LA0
!	33	00100001	041	21	LA1
"	34	00100010	042	22	LA2
#	35	00100011	043	23	LA3
$	36	00100100	044	24	LA4
%	37	00100101	045	25	LA5
&	38	00100110	046	26	LA6
'	39	00100111	047	27	LA7
(	40	00101000	050	28	LA8
)	41	00101001	051	29	LA9
*	42	00101010	052	2A	LA10
+	43	00101011	053	2B	LA11
,	44	00101100	054	2C	LA12
-	45	00101101	055	2D	LA13
.	46	00101110	056	2E	LA14
/	47	00101111	057	2F	LA15
0	48	00110000	060	30	LA16
1	49	00110001	061	31	LA17
2	50	00110010	062	32	LA18
3	51	00110011	063	33	LA19
4	52	00110100	064	34	LA20
5	53	00110101	065	35	LA21
6	54	00110110	066	36	LA22
7	55	00110111	067	37	LA23
8	56	00111000	070	38	LA24
9	57	00111001	071	39	LA25
:	58	00111010	072	3A	LA26
;	59	00111011	073	3B	LA27
<	60	00111100	074	3C	LA28
=	61	00111101	075	3D	LA29
>	62	00111110	076	3E	LA30
?	63	00111111	077	3F	UNL

Table 3-8. US ASCII Character Codes (Continued)

3-46. SPECIAL FUNCTIONS

Special Functions extend the range of the instrument's available functions beyond those normally selectable by dedicated front panel keys. Special Functions are selected by entering numeric special function codes using the front panel numeric keypad.

For example, to select Special Function 2.1 press:

SPEC FUNC 2.1 ENTER

This will set Special Function 2 to 2.1 regardless of its previous state.

For each special function code, the integer value to the left of the decimal selects the special function itself, and the number to the right of the decimal selects the state to which that special function will be set.

Each special function has a basic state which is denoted by a 0 to the right of the decimal. For example, the basic states for Special Functions 2 and 3 are 2.0 and 3.0. The only exceptions to this rule are Special Functions 1 and 16 which have no .0 states. For these two, the basic states are denoted by 1.1 and 16.1 respectively.

The non-basic states are indicated by a number other than 0 to the right of the decimal. For example, 2.1 and 2.2 are non-basic states for Special Function 2.

When the 2075 is powered-on, some special functions assume the basic state and some assume the last state they were in before the instrument was powered-off. For a listing of power-on states see Table 3-3. However, after a PRESET or a Total System Reset is performed, most special functions assume their basic states. Refer to Table 3-3 or 3-9.

Some special functions can be stored along with front panel control parameters in the Front Panel Storage Registers. These storable special functions are indicated in Table 3-3.

The current state for each special function is stored in a Special Functions Table in the 2075. To call up this table for examination, press:

SPEC FUNC

Then use the **UP ARROW** and **DOWN ARROW** keys to move up and down through the table to view the current state of each special function. To exit the Table Viewing Mode press the **SPEC FUNC** key again or complete the keystroke sequence for making a special function entry, *numeric keys* and then **ENTER**. Note that only one special function may be changed or entered while in the viewing mode, and this causes an exit from the mode.

The easiest way to edit the table is to enter the viewing mode and note any changes which are desired. Then simply enter the new special functions.

Table 3-9 lists all special functions, their numeric codes, and the corresponding GPIB codes. The table also shows which special functions revert to their basic states upon power-on and which ones assume their previous states. Special functions which are storable in the Front Panel Storage Registers are also indicated.

For any 2075 with Software Update (SU-6), all special function codes can be sent to the 2075 over the GPIB. The GPIB code for special function is SP. The GPIB code and format to send any special function over the bus is:

SP XX.X ET

Insert the appropriate numeric code for the special function in place of the X's. For example, to set Special Function 14.1 over the bus the code would be SP 14.1 ET. The ET is the terminator (GPIB code for ENTER).

Some special functions also have an alphanumeric code (device message code) which can be sent over the GPIB. These special functions can be sent by using the format above, or by sending the alphanumeric character code. For example, Special Function 15.1 can be sent over the GPIB as:

SP 15.1 ET

Or it can be sent as:

FC CR LF

FC is the alphanumeric code, or device message code, for Special Function 15.1. The CR LF is a carriage return, line feed, and is the general line terminator when sending device messages to the 2075. See Paragraph 4-9 for more information on device messages.

Table 3-9. Special Functions Table

Function Type	SF Code	Power Up	S/ R	GPIB Code	Function Description
Total System Reset	0.0	0.0	N	N/A	Normal measurement
	0.9				Erase BBU RAM data
Select Test Configuration	1.1	1.1	Y	D1	DUT Configuration 1 (Standard default)
	1.2			D2	DUT Configuration 2 (fixed IF; varbl LO)
	1.3			D3	DUT Configuration 3 (varbl IF; fixed LO)
	1.4			D4	DUT Configuration 4 (fixed IF; varbl LO)
	1.5			D5	DUT Configuration 5 (varbl IF; fixed LO)
	1.6			D6	DUT Configuration 6 (2 LO's; fixed & varbl)
Sideband Selection	2.0	2.0	Y	A0	Double Sideband (no offset)
	2.1			A1	Lower Single Sideband
	2.2	A2			Upper Single Sideband
Settle Time or Delay Time	3.0	3.0	N	N/A	Normal Measurement
	3.1			ST	Display/Enter Ext LO settling time or time delay to ignite gas discharge NS
Bandwidth Compensation	4.0	4.0	N	N0	Disable bandwidth compensation
	4.1			N1	Display/Enter DUT bandwidth & go to 4.0
	4.2			N2	Display/Enter 2nd stage BW & go to 4.0
	4.3			N3	Enable bandwidth compensation
ENR Table Selection	5.0	PREV	Y	B0	Use nominal value of ENR
	5.1			B1	Use ENR Table 1 (user must enter)
	5.2			B2	Use ENR Table 2 (user must enter)
	5.3			B3	Use ENR Table 3 (user must enter)
	5.4			B4	Use ROM ENR Table. (Special ROM required)
Measurement Mode	6.0	6.0	N	N/A	Normal Measurement
	6.1			N/A	Manual Noise Figure Measurement
X/Y Output Configurations	7.0	7.2	N	NP	Display NF and Gain vs Frequency on scope
	7.1			P1	Display test pattern #1 on scope
	7.2			P2	Display test pattern #2 on scope
	7.3	or		NQ	Display NF only vs frequency on scope
	7.4			AQ	Display Gain only vs frequency on scope
	7.5	7.5		LL	Move plotter pen to lower left
	7.6			UR	Move plotter pen to upper right
	7.7			FQ	Plot NF vs frequency on plotter*
	7.8			GQ	Plot Gain vs frequency on plotter*
	7.9			FG	Plot on strip chart, X-out=NF/Y-out=G
Display Revision	8.0	8.0	N	N/A	Normal Measurement
	8.1			N/A	Display software update number
Frequency Resolution	9.0	PREV	N	RF	Normal 1 MHz frequency resolution
	9.1			RN	100 KHz frequency resolution

S/R = Store/Recall Capability – can be stored in front panel storage registers. Y = yes, N = no
PREV = Previous value used before power down
* = Activated by single sweep

Table 3-9. Special Functions Table (Continued)

Function Type	SF Code	Power Up	S/ R	GPIB Code	Function Description
Drive for External Relays	10.0				External relay drive voltage ON only during Second Stage Calibration
	10.1				Relay drive voltage continuously ON
Measurement Selection	11.0	11.0	N	NF	Cascade NF measurement (normal mode)
	11.1			YF	Y-Factor measurement
	11.2			OP	Operating Noise Temperature (K) msmnt
	11.3			PM	Power measurement (NS off)
	11.4			PN	Power measurement (NS on)
	11.5			NE	"Noise measure" measurement
Temperature Units Selection for T_{hot}, T_{cold}	12.0	PREV	N	SK	Temperature units in kelvins
	12.1			SC	Temperature units in Centigrade
	12.2			SF	Temperature units in Farenheit
Display ENR In Use	13.0	13.0	N	CO	Normal measurement
				CE	Display ENR in use at the fixed frequency
Hold and Trigger Measurement	14.0	14.0	N	T0	Normal continuous measurement
	14.1			T1	Hold measurement cycle
	14.2			T2	Execute one measurement cycle and hold
Frequency Calibration Interval Selection	15.0	15.0	N	AF	Normal automatic frequency calibration
	15.1			FC	Do an FCAL and return to 15.0
	15.2			DF	Disable auto freq calibration function
Second Stage Calibration Input Gain Selection	16.1	16.1	N	C1	Use calibration setting #1 (0, 15, 30 dB)
	16.2			C2	Use calibration setting #2 (15, 30, 40 dB)
	16.3			C3	Use calibration setting #3 (30, 40, 55 dB)
Loss Compensation Select	17.0	17.0	N	NS	No loss compensation
	17.1			LC	Use loss compensation (use with SF 18)
Display and Enter Loss Data	18.0	18.0	N	L0	Normal measurement
	18.1			L1	Enter loss before the DUT (dB)
	18.2			L2	Enter temperature of DUT before loss
	18.3			L3	Enter loss after the DUT (dB)
IF Atten Calibration	19.0	19.0	N	N/A	Normal measurement
	19.1			IC	Do IF atten calibration and go to 19.0
Voltage/ Atten Display Mode	20.0	20.0	N	V0	Normal measurement
	20.1			V1	Display E-off voltage in window A; RF attenuator setting in window B; IF attenuator setting in window C;
	20.2			V2	Display E-on voltage in window A; RF attenuator setting in window B; IF attenuator setting in window C; (with auto attenuation)
Noise Drive Indicator Function	21.0	21.0	N	LD	Noise source lamp is off
	21.1			LE	Lamp is ON when NS power is ON and OFF when NS power is OFF

Table 3-9. Special Functions Table (Continued)

Function Type	SF Code	Power Up	S/ R	GPIB Code	Function Description
Display Blanking	23.0	23.0	N	DE	Normal measurement
	23.1			DD	Blank all displays during measurement (for GPIB operations only)
Interpolation Selection	24.0	24.0	N	MC	Prohibits NF/G measurements at non-calibrated points
	24.1			MN	Uses interpolation for measurements at non-calibrated points (low accuracy)
Special Functions 30 thru 39 are service functions for use by qualified service personnel only.	30.0	30.0	N	N/A	Return for NF measurement
	30.1			N/A	Hysterisis calibration test
	30.2			N/A	Zero frequency adjust
	30.3			N/A	Low frequency adjust
	30.4			N/A	High frequency adjust
	30.5			N/A	Digital latch test
	31.0	31.0	N	N/A	Return to NF measurement
	31.1			N/A	Display test
	31.2			N/A	Keyboard test
	32.0	32.0	N	N/A	Return to NF measurement
	32.1			N/A	Memory board RAM test
	32.2			N/A	CPU board RAM test
	32.3			N/A	Scope/Plotter RAM test
	33.0	33.0	N	N/A	Return to NF measurement
	33.1			N/A	ROM-1 checksum
	33.2			N/A	ROM-2 checksum
	33.3			N/A	ROM-3 checksum
	33.4			N/A	ROM-4 checksum
	33.5			N/A	ROM-5 checksum
	33.6			N/A	ROM-6 checksum
	33.7			N/A	Total checksum of ROM's 1-6
	34.0	34.0	N	N/A	Return to normal measurement
	34.1			N/A	DMAC chip test
	34.2			N/A	GPIB chip test
	34.3			N/A	Math chip test
	35.0	35.0	N	N/A	Normal measurement
	35.1			N/A	RF Gain peak search
	36.0				Not used
	37.0	37.0	N	R0	Auto RF attenuator
	37.1			R1	Fixed RF attenuator at 0 dB
	37.2			R2	Fixed RF attenuator at 15 dB
	37.3			R3	Fixed RF attenuator at 30 dB
	37.4			R4	Fixed RF attenuator at 40 dB
	37.5			R5	Fixed RF attenuator at 55 dB

Table 3-9. Special Functions Table (Continued)

Function Type	SF Code	Power Up	S/ R	GPIB Code	Function Description
Service Functions (continued)	38.0 38.1 38.2 38.3 38.4 38.5	38.0	N	I0 I1 I2 I3 I4 I5	Auto IF atten (mutually exclsv with 39.x) Fixed IF attenuator at 0 dB Fixed IF attenuator at 5 dB Fixed IF attenuator at 10 dB Fixed IF attenuator at 15 dB Fixed IF attenuator at 20 dB
	39.0 39.1 39.2 39.3 39.4 39.5	39.0	N	N/A I6 I7 I8 I9 IA	Auto IF atten (mutually exclsv with 38.x) Fixed IF attenuator at 25 dB Fixed IF attenuator at 30 dB Fixed IF attenuator at 35 dB Fixed IF attenuator at 40 dB Fixed IF attenuator at 45 dB
SRQ Configuration (for GPIB)	40.0 40.1 40.2	40.0	Y	N/A N/A N/A	Normal addressable talker/listener mode Talk-only mode Controller mode (addressing external LO)
	41.0 41.1				Not used
Service Request	42.0 42.1	42.0	N	NI RA	All SRQs disabled SRQ on “data ready”
Service Request	43.0 43.1	43.0	N	NI RC	All SRQs disabled SRQ on “calibration complete”
	44.0 44.1				Not used
Service Request	45.0 45.1	45.0	N	NI RT	All SRQs disabled SRQ on “ready to tune”
Service Request	46.0 46.1	46.0	N	NI RI	All SRQs disabled SRQ on instrument error
External LO Control Program Selection	47.0 47.1 47.2 47.3 47.4	PREV	Y	N/A N/A N/A N/A N/A	Control program for HP 8672 LO Control program for Wiltron 6600 Sweeper Not used Control program for HP 8350A Control program written by user (48.1)
External LO Control Program Parameters	48.0 48.1	48.0	N	N/A N/A	Normal measurement Enter user defined control program for external LO
GPIB Output Format Selection	49.0 49.1 49.2 49.3 49.4 49.5 49.6	PREV	N	F0 F1 F2 F3 F4 F5 F6	Output Window C data only to GPIB Output Window B data only to GPIB Output Window A data only to GPIB Output Window A and B data to GPIB Output Window A and C data to GPIB Output Window B and C data to GPIB Output Window A, B, and C data to GPIB

On a front panel PRESET (GPIB Device Clear) condition, the special functions in this table will assume the same status as given in the "Power Up" column.

On a Total System Reset (Special Function 0.9), all of the special functions in this table will assume the zero condition. For example, SF 2.x will revert to 2.0; SF 4.x will revert to 4.0, etc. The only exceptions to this are:

Special Function 1.x will revert to 1.1.

Special Function 5.x will revert to its previous setting.

Special Function 7.x will revert to 7.2 or 7.6.

Special Functuion 16.x will revert to 16.1.

Special Function 47.x will revert to its previous setting.

3-47. ERROR MESSAGES

The 2075 generates error messages to provide the user with information concerning incorrect keyboard entries, operating errors, and hardware errors. There are two basic categories of error messages: Transitory and Continuous (Regenerative).

Transitory messages are displayed for two seconds and then disappear. The instrument reverts to its normal activities. Transitory messages usually indicate the denial of some illegal request on the part of the operator.

Continuous messages remain displayed until the error condition is corrected and the 2075 can function normally.

The error messages are divided into ten groups as follows:

10x	ENR Table errors
11x	Calibration errors
12x	Special Function errors
13x	Range errors
14x	RF Hardware errors
15x	Digital Hardware errors
16x	GPIB errors
17x	Measurement Data errors (GPIB)
505	System errors
9xx	System errors

All messages within a particular group will begin with the same two digits. For example, 101, 102, and 103 all belong to the first group.

When the error occurs, the 2075 front panel displays Err xxx, where xxx is the message number.

Table 3-10 lists all the error messages, their meanings, and the necessary corrective actions. Error messages are also listed on the information pull-out card in the bottom of the 2075.

Table 3-10. Error Message Table

ERROR CODE	MEANING	CORRECTIVE ACTION
101	ENR table does not exist (is cleared or empty)	Enter Frequency and ENR values or select correct ENR table. See Paragraph 3-9.
102	Attempt to modify ENR ROM table	Only tables from 5.1 - 5.3 can be modified.
103	ENR table overflow—more than 31 points entered	Enter no more than 31 calibration points in the table.
104	ENR table empty—no calibration data	Enter ENR data in the table before using it.
105	Frequency too low	Increase the frequency so that it is not lower than the lowest ENR table frequency or else enter the ENR value for that frequency.
106	Frequency too high	Decrease the frequency so that it is not higher than the highest ENR table frequency or else enter the ENR value for that frequency.
107	ENR value greater than 18 dB	Only use ENR value greater than 18 dB with proper loss compensation.
110	Measurement at non-calibrated point	Use 24.1 to override but result will be less accurate.
111	Frequency lower than calibration table	Increase the frequency so that it is within the Second Stage Calibration range or re-calibrate.
112	Frequency higher than calibration table	Decrease the frequency so that it is within the Second Stage Calibration range or re-calibrate.
113	IF attenuators not calibrated or data is wrong	Use Special Function 19.1 to re-calibrate. See Paragraph 3-36.
114	Cannot find peak during frequency calibration	Try again using Special Function 15.1. Repeated failure means hardware problem. Contact service center.
115	Calibration data not available	Do Second Stage Calibration before attempting a Noise Figure and Gain measurement.
116	Calibration error, uncalibrated RF range	DUT Gain is greater than 2075's ability to measure. Reduce Gain of DUT or measure Noise Figure only.
117	Calibration table overflow—more than 100	Calibrate with 100 or fewer points (use narrower frequency range or larger step size).

Table 3-10. Error Message Table (Continued)

ERROR CODE	MEANING	CORRECTIVE ACTION
118	Calibration error, due to RF overload	Select different range using SF 16 or check the hardware. Contact service center.
119	Cannot start a frequency calibration	Try again using Special Function 15.1. Repeated failure means hardware problem. Contact service center.
121	Special function does not exist	Use valid special function.
122	Sequence not stored	Use set sequence procedure to set the sequence before using this feature.
123	DUT Configuration has conflicting parameters	Check parameters and try again.
124	Invalid to plot Gain-only while in F-only mode	Check parameters and try again.
131	Frequency range error (Stop frequency is smaller than start frequency)	Enter appropriate frequencies.
133	The IF tuning frequency is beyond 10 to 1900 MHz	Check the DUT configuration.
134	The external LO frequency is out of range	Check the RF and IF combination.
141	RF overload (RF input too high)	Reduce the RF input power.
143	Detector overload (unable to attenuate the detector to proper level)	May have hardware problem. Contact service center.
151	Battery backup RAM error—data may be lost	Re-enter 2075 GPIB address and ENR table data. Perform IF CAL. Check to see if battery is OK.
152	RAM board error	Check board using SF 32.1.
153	ROM board error	Check board using SF 33.x.
154	GPIB board error	Check board using SF 34.2.
155	DMAC board error	Check board using SF 34.1.
156	Scope RAM error	Check board using SF 32.3.
157	A/D converter error	Use Spec Funct 20.1/20.2 to investigate.

Table 3-10. Error Message Table (Continued)

ERROR CODE	MEANING	CORRECTIVE ACTION
158	Math processor error	Check board using SF 34.3.
166	Illegal GPIB mode	Conflict between DUT configuration and GPIB mode.
170	Measured data is out of range	Check measurement setup.
171	Data not available	The requested data is not available in this mode.
505	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
901	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
910	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
911	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
912	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
913	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
914	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
920	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.

3-48. STORE-RECALL REGISTERS

The 2075 can save the current front panel control parameters and then recall them for re-use at a later time. Nine front panel storage registers (Register 1 through Register 9) are available for storing up to nine sets of control parameters. A tenth register, Register 0, saves current control parameters when a PRESET is done. The parameters which are stored are listed in Column 4 of Table 3-3.

To store a set of control parameters, in Register 3 for example, press:

STORE 3 ENTER

The control parameters currently in use are stored in Register 3 and they also remain as the active parameters.

To recall a previously stored set of control parameters, from Register 8 for example, press:

RECALL 8 ENTER

The control parameters which were stored in Register 8 immediately become the active control parameters.

The 2075 can also recall sets of previously stored control parameters in any sequence. The normal recall sequence is from Register 1 through Register 9. To recall in sequence press:

SEQ ENTER

The next register in sequence is recalled and its number is displayed in Window A.

To program a new recall sequence press:

SHIFT SEQ *the numeric keys of the sequence* ENTER

For example, if the new desired sequence is 1,2,3,1,2,3,1,2,3 then the keystroke sequence is:

SHIFT SEQ 123123123 ENTER

Any sequence can be programmed up to a maximum of 9 digits in length.

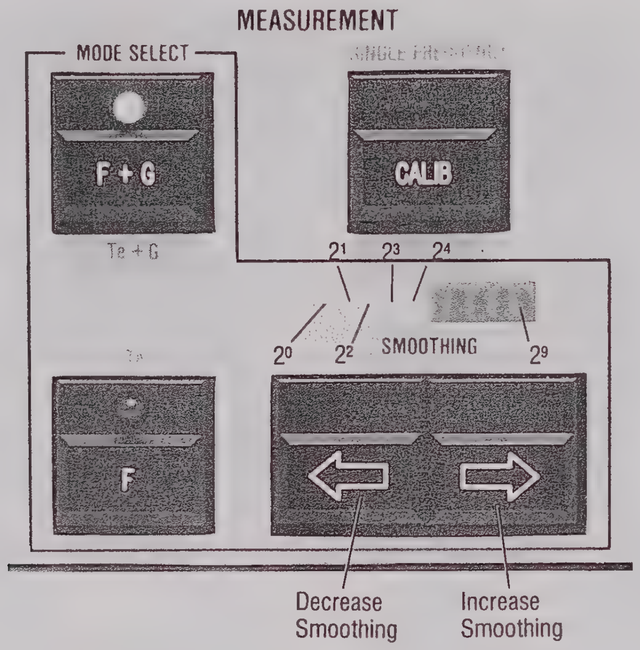
3-49. SMOOTHING FUNCTION

Smoothing can be employed to reduce “jitter” in displayed noise and gain measurements. When smoothing is not in use, each measurement result is displayed immediately. Small, random variations in readings can appear as very rapid changes in the least significant digits of the displayed values.

Smoothing is an averaging function. When smoothing is employed, each measurement is made many times and the results are averaged together. Then the average value is displayed on the front panel. Increasing the amount of smoothing increases the number of measurements made and averaged together, before the average value is displayed.

To increase smoothing press the **RIGHT ARROW** key. Each time the key is pressed, smoothing is increased by one increment. Depress and hold the **RIGHT ARROW** key to add multiple increments. To decrease smoothing, use the **LEFT ARROW** key in similar fashion.

Smoothing is increased or decreased in powers of two. The smoothing indicator is a group of ten LED light bars. The leftmost bar represents 2 to the 0 power. The rightmost bar represents 2 to the 9th power. When minimum smoothing is in use, only the leftmost bar is lit and this indicates that 2 to the 0 power (1) readings are taken and averaged before the result is displayed. Each additional bar, when lit, indicates an increase, by a power of two, in the number of readings taken and averaged before displaying the result. When all the bars are lit, 2 to the 9th power (512) readings are taken and averaged together before the result is displayed. See Figure 3-32.



Each light bar, when illuminated, indicates a power of 2 increase in the number of readings taken before the result is displayed.

Figure 3-32. SMOOTHING INDICATOR

The term SMOOTHING NUMBER refers to the number of LED bars that are lit. If all 10 bars are lit, the smoothing number is 10.

The term SMOOTHING FACTOR refers to the number of measurements taken and averaged before the result is displayed. The smoothing factor is equal to 2 raised to that power which is equal to the smoothing number minus 1. See the equation below:

$$\text{Smoothing Factor} = 2^{(\text{Smoothing Number} - 1)}$$

The 2075 uses two different methods of calculating the displayed value. When swept measurements are made, an arithmetic method is used. In this method, the number of readings taken is equal to the smoothing factor and the readings are averaged to produce the displayed value. The formula for this method is shown:

$$\text{Displayed Value} = \frac{\text{Sum of S measurements}}{S}$$

Where S is the smoothing factor.

In arithmetic smoothing, the display is updated every time that S readings have been taken.

When fixed frequency measurements are made, the smoothing factor is applied exponentially. This smoothing algorithm is designed to give progressively greater weight to prior measurements as the smoothing factor is increased. The formula for the exponential method is as follows:

$$\text{Displayed Value} = \frac{P(S-1) + D}{S}$$

Where:		
	P is the Previous Data Value	(the cumulative previous displayed average)
	D is the Present Data Value	(the single reading just taken)
	S is the Smoothing Factor in use	

As an example, assume a smoothing factor of 32. The above formula becomes:

$$\text{Displayed Value} = \frac{P(32-1) + D}{32} \text{ or } \frac{31P + D}{32}$$

The process of taking S number of readings is referred to as a measurement cycle. For exponential smoothing, the value of P is cumulative through the measurement cycles. Thus, as more measurement cycles are made, the displayed value becomes even more stable.

The following table shows this effect. Column 1 shows the numeric sequence of the measurements. That is, 10 measurements are shown and the sequence is from 1 to 10 (or top to bottom). Column 2 shows the actual reading for each single measurement. The remaining 5 columns show what average value is actually displayed on the front panel when a given smoothing factor is in use. For example, in Column 3, which is for a smoothing factor of 1, each displayed value is exactly the same as the single measurement just taken. In Column 4, which is for a smoothing factor of 2, each displayed value is the average of the last reading just taken and the previous average. To illustrate, the second entry in Column 4 is 2.50 which is the average of the first 2 measurements; 2.52 and 2.48 from column 1. The third entry in Column 4 is 2.53 and this is the average of 2.56 and 2.50.

Note that as the smoothing factor is increased, the displayed value becomes quite stable. Of course, as the smoothing factor is increased, more time is required for the display to show a change.

Measurement Number	**Actual Measurement**	**DISPLAYED VALUE**				
		Smoothing Factor				
		1	2	4	8	128
1	2.52	2.52	2.52	2.52	2.52	2.52
2	2.48	2.48	2.50	2.51	2.52	2.52
3	2.56	2.56	2.53	2.52	2.52	2.52
4	2.53	2.53	2.53	2.52	2.52	2.52
5	2.49	2.49	2.51	2.52	2.52	2.52
6	2.45	2.45	2.48	2.50	2.51	2.52
7	2.44	2.44	2.46	2.48	2.49	2.52
8	2.45	2.45	2.46	2.48	2.49	2.52
9	2.45	2.45	2.45	2.47	2.49	2.52
10	2.44	2.44	2.45	2.46	2.48	2.52

3-50. 100 KHZ DISPLAY RESOLUTION

The normal frequency display resolution of the 2075 is 1 MHz. This resolution can be increased to .1 MHz by Special Function 9.1.

When normal 1 MHz resolution is in use, the frequency display does not show a decimal place. A frequency of 100.9 MHz, for example, will be displayed as 100 MHz. When .1 MHz resolution is in use, one decimal place is shown and the example frequency displayed is 100.9 MHz.

Because Test Configuration 1 operates within the basic 10 MHz to 1900 MHz range of the instrument, use of .1 MHz resolution is practical in this configuration. In Test Configurations 2 through 6, which operate at much higher frequencies, this feature is not practical and cannot be used.

It is important to note that even if .1 MHz display resolution is not in effect, the user can still increment the frequency in steps as small as .1 MHz. In such a case, the display will not show the fractional steps. For instance, if the frequency is incremented in .1 MHz steps, from 100.0 MHz to 101.0 MHz, the display will continue to show 100 MHz while the frequency is changing from 100 MHz through 100.9 MHz.

To select .1 MHz resolution press:

SPEC FUNC   9.1   ENTER

To select 1 MHz resolution press:

SPEC FUNC   9.0   ENTER

The GPIB code to select .1 MHz resolution is RN.

The GPIB code to select 1 MHz resolution is RF.

3-51. SOFTWARE REVISIONS

A special function is used to display the software update level of the 2075. To determine the software update level press:

SPEC FUNC   8.1   ENTER

The update level is displayed in Window A as SU-X, where X is the update level number. Software Update Level 6 would be displayed as SU-6.

This manual is written to software update 6. The following changes have been incorporated in SU-6:

1. The maximum input frequency that can be measured at the input port is now 1900 MHz (specifications apply up to 1850 MHz).

2. There is no minimum allowable entry for ENR values. The maximum allowable ENR value is now 80 dB.

   The maximum usable effective ENR is 18 dB. That is, values of up to 80 dB can be entered. However, these can be used by the 2075 during calculations, only if sufficient loss compensation (Loss 1) is employed so that ENR (dB) minus Loss 1 (dB) is no greater than 18 dB.

   NOTE

   ENR is always entered as dB, however it may be displayed as dB or as a ratio. When entering a value down to -9.99 dB, the display will show dB. However when entering a value below -9.99 dB, the display will automatically show the value as a ratio.

3. The maximum allowable frequency for an ENR value is now 65,535 MHz.

4. The maximum RF frequency measurable is now 65,535 MHz.

5. The allowable range of entries for T_{hot} is now 0 to 18,588 kelvins.

6. Special Function 15.2 disables the automatic periodic FCAL and also disables the FCAL at the beginning of Second Stage Calibration.

7. During any Test Configuration the 2075 can be placed in any GPIB mode.

8. During Second Stage Calibration, pressing the **CALIB** key stops the calibration but the calibration data taken up to that point is retained. However, the CAL1 step must have been

completed before the **CALIB** key was pressed. When this is done the instrument goes into uncorrected mode. However, it can be returned to corrected mode by pressing the **F + G** key.

Where heavy smoothing is in use, performing all the steps of Second Stage Calibration can take a long time. This feature avoids the need to complete all three steps (CAL1, CAL2, and CAL3) of the Second Stage Calibration. However, the user must be sure that when the measurement is made, the DUT gain is flat enough so that the 2075 does not need to use a different input gain setting. Otherwise the instrument will use old calibration data for that gain setting and the measurement will be erroneous.

9. When manual Noise Figure measurements are made, the instrument can now be operated in Talk Only Mode for outputting data to a printer.

10. When a Gas Discharge type noise source is used, the delay time can be entered by the user and its allowable range is from 1 msec to 10 seconds. The value is always entered in milliseconds. As an example, to enter a delay time of 2 seconds, press:

    SPEC FUNC 3.1 ENTER

    2000 ENTER

    To activate usage of this delay time, press:

    SPEC FUNC 22.1 ENTER

NOTE

Where an external local oscillator is used, the value entered under Special Function 3.1 is used for the local oscillator settling time. This same value is also used for the trigger delay time if Special Function 22.1 has been activated.

11. The user defined control program for external local oscillators now has an additional control character: Control G = decimal 7 = ASCII BEL. The 2075-2A will interpret this character to mean that the frequency units for the external LO are in GHz.

12. A new special function has been added; Special Function 10.0. Special Function 10.0 causes voltage to be applied to external relays only during Second Stage Calibration. Special Function 10.1 causes voltage to be always applied to the external relays.

13. A new GPIB code has been added which allows any special function to be set via the bus. This new code is SP. To set any special function over the bus, send:

    SP XX.X ET

    Where XX.X is the numeric code for that special function.

14. The absolute need to send the UNTALK command to the 2075-2A after it has been ADDRESSED TO TALK and then has finished talking, is no longer necessary.

SECTION 4

GPIB OPERATION

4-1. INTRODUCTION

This section of the manual provides information related to operation of the 2075 over the General Purpose Interface Bus. Whereas operating procedures in general are covered in Section 4 of this manual, this section provides the necessary additional information to accomplish those procedures over a GPIB. This section assumes that the user has some familiarity with operation and programming of GPIB devices.

4-2. GPIB GENERAL INFORMATION

This paragraph is included to provide some basic information and concepts related to operation of the General Purpose Interface Bus.

The GPIB is a standardized digital interface system which allows the exchange of digital data and commands between programmable electronic instruments. The GPIB was first established as a standard by the Standards Board of the Institute of Electrical and Electronic Engineers (IEEE) in 1975. The defining document, IEEE-488 1975, was published in that year. After minor editorial revisions, the document was republished in 1978 as IEEE-488 1978.

The IEEE standard was adopted by the American National Standards Institute (ANSI) in 1976 and was published as ANSI Standard MC 1.1. The user should refer to either of these documents for detailed information regarding operations of the GPIB.

As many as 15 devices can be connected to the bus at one time. There are 4 basic types of devices and these are classified according to the 3 basic bus functions which they perform: CONTROLLER, TALKER, LISTENER, and TALKER/LISTENER. The CONTROLLER manages the bus and tells the other devices when to talk and when to listen. Only the controller can send commands but it can also send and receive data. A TALKER can send data. A LISTENER can receive data. A TALKER/LISTENER can send and receive data.

The CONTROLLER commands a device to talk by sending an ADDRESS TO TALK command to that device. The CONTROLLER commands a device to listen by sending an ADDRESS TO LISTEN command. Since an address is used as part of the command, only the device having that address will comply with that command.

There can be only one active controller on the bus. Some GPIB applications use two or more controller devices, but in such cases active control of the bus is switched back and forth between them. Thus, there is still only one active controller at any given time.

At any one time, only one device on the bus can be the talker. However, when a device is talking there can be several listeners at the same time.

The GPIB is a 24 wire interface. Of the 24, eight wires are common return lines and 16 wires are signal lines. The 16 signal lines are grouped as 8 data lines, 5 bus control lines, and 3 handshake lines. These are shown in Figure 4-1.

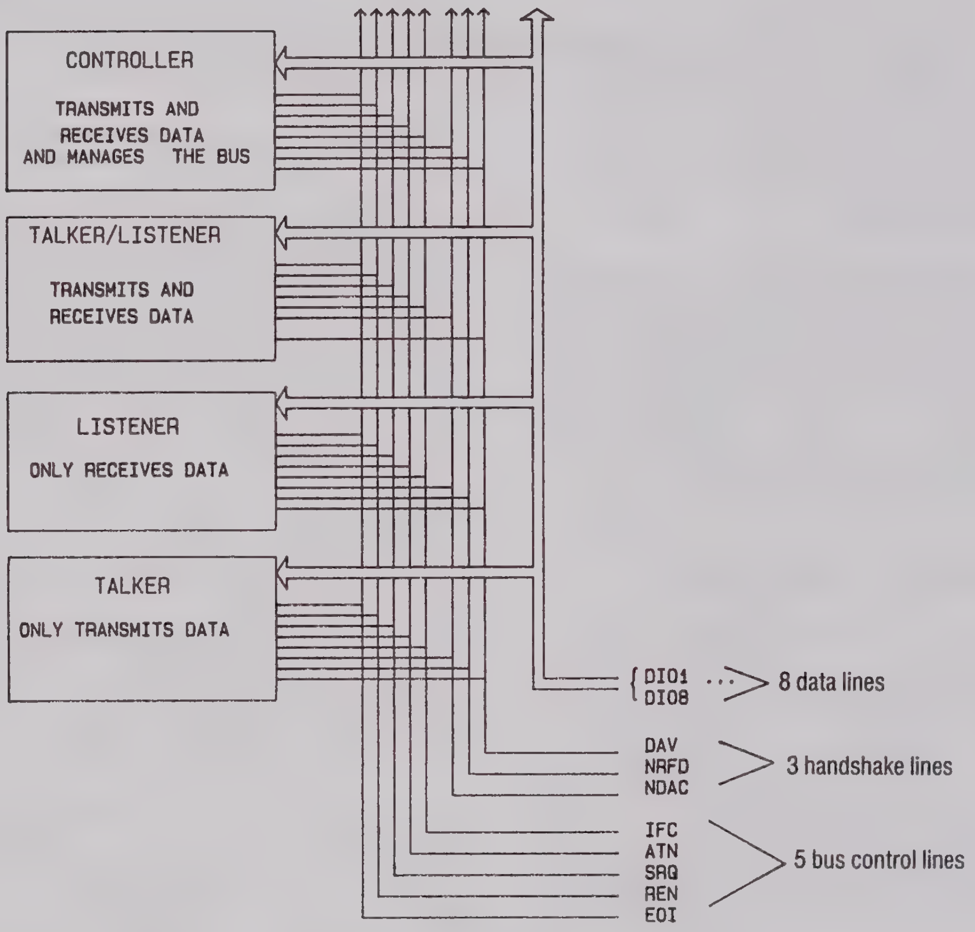

CONTROLLER
TRANSMITS AND RECEIVES DATA AND MANAGES THE BUS
TALKER/LISTENER
TRANSMITS AND RECEIVES DATA
LISTENER
ONLY RECEIVES DATA
TALKER
ONLY TRANSMITS DATA
DIO1 ... DIO8
8 data lines
DAV
NRFD
NDAC
3 handshake lines
IFC
ATN
SRQ
REN
EOI
5 bus control lines

Figure 4-1. GENERAL PURPOSE INTERFACE BUS

The bus is operated in two basic modes: Command Mode and Data Mode. The controller places the bus in Command Mode by setting the ATN line to TRUE. In this mode the controller can transmit multiline commands on the 8 data lines or it can transmit single line commands by setting the states of the bus control lines. Commands belong to either the Universal Command Group (UCG) or the Addressed Command Group (ACG). All devices on the bus respond to a UCG commmand. Only the addressed device will respond to an ACG command. Both the ADDRESS TO TALK and the ADDRESS TO LISTEN command are ACG commands.

The controller places the bus in Data Mode by setting the ATN line to FALSE. In Data Mode, data is transmitted on the 8 data lines and it is normally encoded in 7 bit ASCII format with the 8th bit used for parity. Data transmission occurs in a byte serial, bit parallel mode. Any talker can place data on the bus, but only after it has been addressed to talk by the controller.

The 3 handshake lines carry the signals DAV, NRFD, and NDAC. These three lines are used to establish the correct timing of the asychronous data exchanges between all devices. The states of these lines can be read or set by any device as part of the handshake process.

The 5 bus control lines carry the signals ATN, REN, IFC, SRQ, AND EOI. Only the controller can set the states of the ATN, REN, and IFC lines. The SRQ line can be set by any device (except the controller) when it requests service from the controller. The EOI line state can be set by any device, including the controller, when it is being a talker. The 5 bus control lines are used to send single line messages.

For more detailed information on GPIB operation refer to IEEE-488 1978 or ANSI MC 1.1.

4-3. GPIB OPERATING MODES

The 2075 can be operated in three different and mutually exclusive GPIB modes which are Normal TALKER/LISTENER, TALK ONLY (TALK ALWAYS), and LIMITED CONTROLLER. Special Function 40 is used to select the mode.

Normal TALKER/LISTENER is the mode used when the 2075 is controlled by an external GPIB compatible controller. The 2075 assumes this mode upon power-up. However, it is still in local mode and is controllable from the front panel until the external controller sends the first ADDRESS TO LISTEN command. Upon receipt of this command the 2075 goes into remote mode, control reverts to the external controller, and the front panel is locked out (except for the LOCAL key). The 2075 can LISTEN or TALK while in this mode.

To select this mode press:

SPEC FUNC 40.0 ENTER

TALK ONLY (or TALK ALWAYS) mode is a local mode, in which the front panel controls are used to operate the 2075. This mode is used to send measurement data to a GPIB compatible printer, when no external controller exists. To select this mode press:

SPEC FUNC 40.1 ENTER

LIMITED CONTROLLER mode is used when the 2075 controls the operation of an external local oscillator and no external controller exists. This is a local mode and control is therefore accomplished from the front panel. To select this mode press:

SPEC FUNC 40.2 ENTER

4-4. SETTING THE GPIB ADDRESS

The GPIB address of the 2075 can be entered through the front panel when the unit is in a local mode. To enter the address (for example, 15), press:

LOCAL 15 ENTER

The current address can be displayed by pressing only the **LOCAL** key.

The GPIB address is saved when the unit is powered-off. It is also saved when the unit is preset by pressing the **PRESET** key. When a total system reset is performed (Special Function 0.9) the current address is lost and it is set to the default value of 8.

4-5. GPIB COMPATIBILITY

The 2075 can interface with any GPIB compatible controller or computer. The GPIB functional capabilities of the 2075, as defined by IEEE-488 1978, are shown in Table 4-1.

Table 4-1 GPIB Functional Capabilities

AH1	Complete acceptor handshake
SH1	Complete source handshake
T5	Complete talker
L4	Complete listener, except no LISTENER ONLY
SR1	Complete Service Request
RL1	Complete Local/Remote
PPO	No parallel poll
DC1	Complete Device Clear
DT1	Complete Device Trigger
C1	System Controller
C3	Capable of sending REN
C28	Capable of sending interface message only

Note that the mnemonic codes are not control codes for the 2075.

For a more detailed explanation of the codes above refer to IEEE-488 1978 or ANSI Standard MC 1.1.

4-6. REMOTE AND LOCAL MODES

When the 2075 is in the LOCAL mode, all control is accomplished via the front panel keys. When the 2075 is in the REMOTE mode, it is controlled by an external controller and the front panel keys are locked out. However, the **LOCAL** key on the front panel is not locked out unless the controller has sent a local lockout message.

The 2075 is always in local mode when it is in the TALK ONLY (TALK ALWAYS) or LIMITED CONTROLLER mode.

When the instrument is powered up it assumes the normal TALKER/LISTENER mode by default, and it is also in local mode. The 2075 goes into the remote mode only when it is in normal TALKER/LISTENER mode, and only after the external controller has placed it in remote. To do this, the controller first sets the REN (Remote enable) line TRUE, and then sends an ADDRESS TO LISTEN command to the 2075. If no external controller exists, the unit will remain in local mode.

The RMT (REMOTE) annunciator in Window A is lit when the unit is in the remote mode.

The 2075 can always communicate via the GPIB regardless of the mode it is in. However, it can receive data or commands from an external device only when in the normal TALKER/LISTENER mode.

4-7. GPIB MESSAGE TYPES

The 2075 communicates on the GPIB interface by sending or receiving four basic categories of messages. These are:

INTERFACE BUS MESSAGES

DEVICE MESSAGES

DATA MESSAGES

STATUS MESSAGES

4-8. INTERFACE BUS MESSAGES

These are commands sent by the controller to the devices on the bus when the bus is in the Command Mode (ATN line is TRUE). Most of these are multiline messages and all belong to either the ACG or UCG. These messages are defined by IEEE-488 1978 and all are device independent. That is, the manner in which the message is transmitted does not vary from one type of device to another. These messages are listed in Table 4-2 on page 4-6.

DEVICE CLEAR Message

The DEVICE CLEAR message clears the current control parameters from the 2075 and causes it to assume the PRESET control parameters. That is, the CLEAR command has the same effect as depressing the front panel **PRESET** key. The CLEAR or PRESET control parameters are listed in Table 3-3.

The 2075 also responds to the SELECTIVE DEVICE CLEAR command (an ACG command) when it is addressed to listen. It will respond to the DEVICE CLEAR command (a UCG command) whether addressed or not.

TRIGGER Message

The GROUP EXECUTE TRIGGER Message causes the 2075 to execute one complete measurement cycle according to its previously programmed parameters. The 2075 must be addressed to listen to receive this multiline message.

The program message, T2, causes the same response as the GROUP EXECUTE TRIGGER message. Hovever, the 2075 must previously have been set to the HOLD mode by the program message T1.

REMOTE Message

The REMOTE message places the 2075 in the remote mode. The REMOTE message is sent in two steps: first, the REN line is set to TRUE by the controller, and second, the ADDRESS TO LISTEN command is sent. The 2075 does not actually switch into remote until it receives the ADDRESS TO LISTEN command.

When the instrument switches from local to remote, none of the front panel control parameters are changed. However, the front panel keys, except **LOCAL** are disabled. When in the remote mode, the RMT annunciator is lit and any changes in control parameters must come from the controller.

LOCAL Message

The LOCAL message is the GO TO LOCAL (GTL) bus command. When the 2075 is in remote mode and it receives this message from the controller, it will respond by going to local mode. Control is returned to the front panel keys.

If the instrument is in LOCAL LOCKOUT when the LOCAL message is received, front panel control is still returned but the LOCAL LOCKOUT is not cleared. This means that the next time the 2075 is placed back into remote, the **LOCAL** key will be disabled. This can be avoided by sending the CLEAR LOCKOUT/SET LOCAL message when commanding the instrument to go to local.

Changing the instrument from remote to local mode does not change any of the control parameters.

When the 2075 is in the remote mode and local lockout is not in effect, it can be returned to local by pressing the **LOCAL** key. It is possible, however, for this action to cause the loss of any data message currently being sent. This can be avoided by enabling local lockout, and by returning the instrument to local using the appropriate command from the controller.

LOCAL LOCKOUT Message

If the 2075 is in the remote mode, the LOCAL LOCKOUT command causes it to disable the front panel **LOCAL** key.

If the 2075 is in local and the REN (Remote Enable) line is set to TRUE, the LOCAL LOCKOUT will not cause any immediate change. However, the first time it is addressed to listen, it will switch into remote mode and the **LOCAL** key will be locked out.

When local lockout is in effect the 2075 can be returned to local mode by any of the following:

a. the LOCAL message

b. the CLEAR LOCKOUT/SET LOCAL message

c. setting the POWER switch to OFF and then back to ON

d. removing the GPIB cable

CLEAR LOCKOUT/SET LOCAL Message

The controller sends the CLEAR LOCKOUT/SET LOCAL message by setting the REN line to FALSE. The 2075 responds to this command by returning to local mode, clearing the local lockout, and restoring control to the front panel keys. The transition from remote to local does not change any of the instrument control parameters.

INTERFACE CLEAR Message

The controller sends the IFC (UCG) message by setting the IFC (Interface Clear) bus control line to TRUE. Upon receipt of this command, the 2075 and all other devices on the bus stop talking or listening, and return to LOCAL.

Table 4-2. GPIB Function Reference Table

GPIB MESSAGE	RESPONSE	RELATED COMMANDS & CONTROLS	INTERFACE FUNCTIONS
Interface Clear	The Noise-Gain Analyzer stops talking or listening and returns to LOCAL.	IFC (UCG)	ALL
Device Clear	The Noise-Gain Analyzer is set to the same conditions established by pressing the PRESET key. Refer to Table 3-3.	DCL(ACG) SDC(UCG)	DC1
Clear Lockout/ Set Local	The Noise-Gain Analyzer returns to local (front panel control) and local lockout is cleared when the REN bus control line goes FALSE. When entering local mode, no instrument settings or functions are changed.	DISABLE REN (UCG)	RLI
Local	The Noise-Gain Analyzer returns to local mode (front panel control). It responds equally to the GTL bus command and the front panel LOCAL key. When entering the local mode, no instrument settings or functions are changed.	GTL(ACG)	PL1
Local Lockout	Disables the LOCAL key so that only the controller can return the Noise Gain Analyzer to local.	LLO(UCG)	RL1
Remote	The instrument is allowed to enter the Remote mode when the REN bus control line is TRUE. However, remote mode is not entered until the first time it is addressed to listen. The front panel REMOTE annunciator lights when the instrument is actually in the remote mode. When entering the remote mode, no instrument settings or functions are changed, but all front panel keys except LOCAL are disabled. All instrument control now comes from GPIB.		RL1 L4

* Commands, Control Lines, and Interface Functions are defined in IEEE-488, 1978. Knowledge of these may not be necessary if your controller's manual describes programming in terms of the GPIB Messages shown in the left column, or a similar program command.

* ACG = Addressed Command Group. UCG = Universal Command Group.

4-9. DEVICE MESSAGES

These are the messages or codes used to remotely program the 2075 to set up and then execute measurements. Some of these messages are parameter codes which are used to enter numeric values, such as start frequency, stop frequency, etc. to be used during the measurement. Others are mode commands which tell the 2075 to set some mode or special function which is to be used during the measurement. Still others are used to execute some function such as calibration or measurement.

These are all device dependent messages which are specific to the 2075. Each of these messages is a two character (two byte) code and the 2075 must be addressed to listen in order to receive these codes. The controller sends these messages to the 2075 when the bus is in the Data Mode (the ATN line is set to FALSE by the controller).

The device messages are listed in Tables 4-3 and 4-4.

Device Message Formats

Device messages are sent either as single messages (one at a time) or as multiple messages (a group of messages). The format for single messages is slightly different from that for multiple messages. A multiple message may have a separator between each single message in the group and uses a line terminator only at the end of the group. A single message has no separators but is also ended with a line terminator.

Single messages are formatted as follows:

	Header	Data	Data Terminator	Line Terminator
Example:	SS	150	MZ	[CR] [LF]

Note that the example above is a single message which requires a numeric data entry and therefore has a data terminator. For a single message which requires no numeric data entry, the format is as follows:

	Header	Line Terminator
Example:	DG	[CR] [LF]

Note that the line terminator for the message is Carriage Return/Line Feed.

A multiple message is formatted as follows:

	Header	Data	Data Terminator	Separator
	Header	Data	Data Terminator	Separator
	Header	Data	Data Terminator	Line Terminator
Example:	FA	10	MZ	,
	FB	10	MZ	,
	SS	10	MZ	[CR] [LF]

Note that the separator in the above example is a comma and that the line terminator is Carriage Return/Line Feed. A space could have been used for the separator instead of a comma. The terms are explained below.

The Header is the two character code that corresponds to a front panel key or special function. These are listed in Table 4-3 and 4-4. Some examples are SS (Step Size) and FA (Start Frequency).

Data is the numeric value representing the quantity associated with the header. Some headers do not require a data value.

The Data Terminator must follow every data entry. The data terminator usually defines the quantity which is represented by the numeric value. The allowable data terminators are MZ (Megahertz), DB (Decibels), DG (Temperature), and ET (the ENTER key). No other data terminator is acceptable.

The Separator is a convenience feature which makes a multiple message easier to read by separating its individual messages. The separator may be a comma or a space. If preferred, a separator need not be used at all. The following examples show three different ways of entering the same multiple message. The example message sets Start Frequency to 10 MHz, Stop Frequency to 100 MHz, Step Size to 10 MHz, Gain Upper Limit to 40 dB, and Gain Lower Limit to 0 dB.

Comma as separator

FA10MZ,FB100MZ,SS10MZ,UG40DB,LG0DB [CR] [LF]

Space as separator

FA10MZ FB100MZ SS10MZ UG40DB LG0DB [CR] [LF]

No separators

FA10MZFB100MZSS10MZUG40DBLG0DB [CR] [LF]

The Line Terminator is the delimiter used to indicate the end of a message. It is the Carriage Return/Line Feed sequence. Depending on how the controller is programmed, the Line Feed may be sent with the EOI line set TRUE or FALSE. Either method is acceptable to the 2075. In a computer where the program is written in some higher level language such as BASIC, the terminators are inserted automatically and will not appear in the program line.

Table 4-3. Table of GPIB Codes

GPIB CODE	PARAMETER
A0	Double Sideband
A1	Lower Single Sideband
A2	Upper Single Sideband
AF	Normal automatic frequency calibration
AQ	Display gain (only) vs. frequency on scope
B0	Use ENR TABLE 0 with nominal values
B1	Use ENR Table 1. User must enter
B2	Use ENR Table 2. User must enter
B3	Use ENR Table 3. User must enter
B4	Use ROM ENR Table. Special ROM required
C1	Use calibration setting #1
C2	Use calibration setting #2
C3	Use calibration setting #3
CA	Second Stage Calibration
CE	Display ENR in use
CO	Normal measurement
CT	Clear ENR table in ENR mode
D1	DUT Configuration 1
D2	DUT Configuration 2
D3	DUT Configuration 3
D4	DUT Configuration 4
D5	DUT Configuration 5
D6	DUT Configuration 6
D8	Terminator for dB unit entries
DD	Blank all displays during measurement
DE	Normal measurement
DF	Disable automatic frequency calibration
DG	Terminator for degree unit entries
EF or EN	Disable ENR entry mode
EN only	Enable ENR entry mode
ET	General entry terminator code

Table 4-3. Table of GPIB Codes (Continued)

GPIB CODE	PARAMETER
F0	Output window C data only
F1	Output window B data only
F2	Output window A data only
F3	Output window A & B data
F4	Output window A & C data
F5	Output window B & C data
F6	Output window A, B & C data
FA	START FREQ prefix
FB	STOP FREQ prefix
FC	Do a frequency calibration
FF	Front panel FIXED FREQ key
FG	X-out = NF/Y-out = gain (on strip chart)
FQ	Plot NF vs frequency on plotter
GD	Front panel Gain RATIO/dB key at dB setting
GF	Normal measurement (no time delay)
GQ	Plot gain vs frequency on plotter
GR	Front panel Gain RATIO/dB key at RATIO setting
GS	Time delay to ignite gas source (1 msec)
I0	IF Autorange
I1	IF attenuator setting 1
I2	IF attenuator setting 2
I3	IF attenuator setting 3
I4	IF attenuator setting 4
I5	IF attenuator setting 5
I6	IF attenuator setting 6
I7	IF attenuator setting 7
I8	IF attenuator setting 8
I9	IF attenuator setting 9
IA	IF attenuator setting 10
IC	Execute IF attenuator calibration
IF	IF FREQ prefix
L0	Normal measurement
L1	Enter loss before the DUT (dB)
L2	Enter temperature of the losses
L3	Enter the loss after the DUT (dB)
LC	Use loss compensation (use with SF 18)
LD	Noise drive indicator disable
LE	Noise drive indicator enable
LG	Lower gain limit
LL	Move plotter pen to lower left
LN	LOWER LIMIT (NOISE) prefix
LO	LO FREQ prefix

Table 4-3. Table of GPIB Codes (Continued)

GPIB CODE	PARAMETER
MC	Prohibit NF/G measurements at non-calibrated points
MN	Use interpolation at non-calibrated points
MZ	Terminator for MHz unit entries
N0	Disable bandwidth compensation
N1	Bandwidth #1 prefix
N2	Bandwidth #2 prefix
N3	Enable bandwidth compensation
ND	Front panel NF RATIO/dB on dB setting
NE	Measure noise measure (M)
NF	Measure cascade noise figure
NG	Measure first stage noise figure and gain
NI	All SRQs disabled
NP	Normal oscilloscope (NF and Gain vs Freq)
NQ	Display NF (only) vs Freq on oscilloscope
NR	Front panel NF RATIO/dB in RATIO setting
NS	Loss compensation off
OP	Measure operating noise temperature
P1	Display test pattern #1 on oscilloscope
P2	Display test pattern #2 on oscilloscope
PM	Power measurement (NS off)
PN	Power measurement (NS on)
R0	RF auto-range
R1	RF attenuator setting 1
R2	RF attenuator setting 2
R3	RF attenuator setting 3
R4	RF attenuator setting 4
R5	RF attenuator setting 5
RA	SRQ on data ready
RC	SRQ on calibration complete
RF	1 MHz frequency resolution
RI	SRQ on instrument error
RN	100 KHz frequency resolution
RT	SRQ on ready to tune
S0	Smoothing factor = 1
S1	Smoothing factor = 2
S2	Smoothing factor = 4
S3	Smoothing factor = 8
S4	Smoothing factor = 16
S5	Smoothing factor = 32
S6	Smoothing factor = 64
S7	Smoothing factor = 128
S8	Smoothing factor = 256
S9	Smoothing factor = 512
SC	Temperature units in degrees Centigrade
SF	Temperature units in degrees Fahrenheit
SG	SWEEP SINGLE
SK	Temperature units in kelvins
SL	SECOND LO FREQ
SN	SWEEP off
SP	SPECIAL FUNCTION
SR	SWEEP AUTO
SS	STEP SITE prefix
ST	Settling time
TO	Normal continuous measurement
TI	Hold measurement
T2	Execute one measurement cycle and hold
TC	T_{cold} (K) prefix
TE	T_e measurement mode
TG	T_e + G measurement mode
TH	T_{hot} (K) prefix
UG	UPPER LIMIT GAIN prefix
UN	UPPER LIMIT NOISE prefix
UR	Move plotter pen to upper right
V0	Normal measurement
V1	Display E-off in window A; RF attenuator setting in window B; IF attenuator setting in window C
V2	Display E-on in window A; RF attenuator setting in window B; IF attenuator setting in window C
YF	Y-factor for noise figure

Table 4-4. Front Panel Keys and Equivalent GPIB Codes

KEY #	NON-SHIFTED FUNCTION	GPIB CODE	SHIFTED FUNCTION	GPIB CODE
1	PRESET	DC or SDC*	N/A	
2	SPEC FUNC	N/A	N/A	
3	SHIFT	N/A	N/A	
4	LOCAL	N/A	EXT LO ADDRESS	
6	ENR	EN	T_{hot} (K)	TH
	Toggle ENR OFF	EF	N/A	
7	ON/OFF Cycle	N/A	T_{cold} (K)	TC
12	RATIO or dB (Gain)	GR/GD	N/A	
15	RATIO or dB (NF)	NR/ND	N/A	
16	CALIB	CA	SINGLE FREQ calibration	
19	Incr Smoothing	S0 thru S9		
20	Decr Smoothing	No direct equivalent		
22	F + G	NG	T_e + G	TG
23	F	NF	T_e	TE
	0	0	N/A	
	1	1	N/A	
	2	2	N/A	
	3	3	N/A	
	4	4	N/A	
	5	5	N/A	
	6	6	N/A	
	7	7	N/A	
	8	8	N/A	
	9	9	N/A	
	- (MINUS)	–	N/A	
	. (dec point)	.	N/A	
27	CLEAR Entry	N/A	CLEAR ENR table	CT
28	ENTER	ET,MZ,DB,DG	N/A	
29	SEQuence	N/A	SET SEQUENCE	N/A
30	STORE	N/A	N/A	
31	RECALL	N/A	N/A	
32	FIXED FREQ	FF	Manual STEP SIZE	N/A
33	Increment	N/A	EXT LO AMPLITUDE	N/A
34	Decrement	N/A	SECOND LO FREQ	SL
35	UPPER LIMIT NOISE	UN	UPPER LIMIT GAIN	UG
36	LOWER LIMIT NOISE	LN	LOWER LIMIT GAIN	LG
37	START FREQ	FA	IF FREQ	IF
38	STOP FREQ	FB	LO FREQ	LO
39	SWEEP AUTO	SR	SWEEP SINGLE	SG
39	Toggle SWEEP Off	SN	N/A	
40	STEP SIZE	SS	N/A	

*DC = Device Clear. SDC = Selective Device Clear. Refer to the manual for the controller to see how to do this.

"Key #" is the number of the key on the front panel per Figure 3-1 and Table 3-1.

4-10. DATA MESSAGES

These messages consist of data which is the result of a measurement performed by the 2075. These messages are sent by the 2075 to the active listener on the bus. The 2075 can send data messages in Normal TALKER/LISTENER or TALK ONLY (TALK ALWAYS) mode.

A measurement message can consist of the data from Window A (the Frequency display), Window B (the Gain display), and Window C (the Noise Figure display). The user selects which data is to be output to the GPIB by setting Special Function 49. The possible choices are shown below:

Table 4-5. Selection of Data Message Contents

DATA OUTPUT TO GPIB	SPECIAL FUNCTION CODE	GPIB CODE
Output Window C data only	49.0	F0
Output Window B data only	49.1	F1
Output Window A data only	49.2	F2
Output Windows A and B data	49.3	F3
Output Windows A and C data	49.4	F4
Output Windows B and C data	49.5	F5
Output Windows A, B, and C data	49.6	F6

Outputting Data Messages in TALK ONLY Mode

The TALK ONLY (TALK ALWAYS) mode is used specifically to allow the 2075 to send its data to a GPIB compatible printer when there is no external controller and when there is no external local oscillator being controlled by the 2075. When in this mode, the 2075 can be configured to output data at the completion of each measurement cycle or to output data only during a Single Swept measurement. It can also be configured to send Second Stage Calibration data.

Use this procedure to output data at the end of each measurement cycle when in the TALK ONLY mode:

1. Select the data message content by entering the appropriate subordinate function of Special Function 49. For example, to select "Output of data from Windows A, B, and C", press:

   SPEC FUNC 49.6 ENTER

2. Set the printer to LISTEN ONLY (LISTEN ALWAYS) mode.

3. Set the 2075 to TALK ONLY mode by pressing:

   SPEC FUNC 40.1 ENTER

The 2075 will send measurement data out to the printer at the end of each measurement cycle until it is reset by entering Special Function 40.0. If the printer is not ready to receive the data, the 2075 will pause and wait until the data is received. Then it will go on to make its next measurement cycle.

If continuous output to the printer is not desired, the 2075 can be configured to output data only during a single sweep by performing the following procedure:

1. Select the data message content by entering the appropriate subordinate function of Special Function 49. For example, to select, "Output of data from Windows A and B", press:

   SPEC FUNC 49.3 ENTER

2. Set the printer to LISTEN ONLY (LISTEN ALWAYS) mode.

3. Set the 2075 to TALK ONLY mode by pressing:

   SPEC FUNC 40.1 ENTER

4. Initiate a single sweep by pressing:

   SHIFT SWEEP

The 2075 will output data to the printer only during the time period of the single sweep.

Note that if the Start and Stop frequencies are made the same, the instrument will output one set of data to the printer when a single sweep is initiated.

To configure the 2075 to send Second Stage Calibration data, use the following procedure:

1. Select the data message content by entering the appropriate subordinate function of Special Function 49. For example, to select, "Output of data from Windows A, B, and C", press:

   SPEC FUNC   49.6   ENTER

2. Set the printer to LISTEN ONLY (LISTEN ALWAYS) mode.

3. Enable the HOLD function by pressing:

   SPEC FUNC   14.1   ENTER

4. Set the 2075 to TALK ONLY mode by pressing:

   SPEC FUNC   40.1   ENTER

5. To perform the calibration and output the data to the printer, press:

   CALIB

The 2075 will output data to the printer only during the calibration. Where Special Function 49.6 has been entered to choose data from Windows A, B, and C, the printer will print out the frequency, calibration step number, and the noise figure. An example of this output is shown in Figure 4-2.

Calibration Step

Frequency

Second Stage Noise Figure

CALIBRATION DATA

```
100,CAL1, 4.93
150,CAL1, 5.38
200,CAL1, 5.33
250,CAL1, 5.43
300,CAL1, 5.67
350,CAL1, 5.84
400,CAL1, 5.74
450,CAL1, 5.81
500,CAL1, 6.07
100,CAL2, 8.82
150,CAL2,10.20
200,CAL2, 9.89
250,CAL2, 9.72
300,CAL2,10.27
350,CAL2,10.93
400,CAL2,10.41
450,CAL2,11.49
500,CAL2,11.83
100,CAL3,22.75
150,CAL3,24.03
200,CAL3,23.74
250,CAL3,23.64
300,CAL3,23.96
350,CAL3,25.39
400,CAL3,24.40
450,CAL3,25.67
500,CAL3,25.77
```

Frequency Gain Noise Figure

MEASUREMENT DATA

```
100, -0.03,-0.06
150, -0.03,-0.01
200, -0.04,-0.01
250, -0.04, 0.02
300, -0.04,-0.03
350, -0.02,-0.13
400, -0.03,-0.06
450, -0.05, 0.07
500, -0.03, 0.01
```

Figure 4-2. SAMPLE DATA OUTPUT

Outputting Data Messages in Normal TALKER/LISTENER Mode

The Normal TALKER/LISTENER mode is the GPIB operating mode in which the 2075 is controlled by an external controller or computer. In this mode, for data messages to be output to a listener device, the controller performs two steps:

1. The controller sends an ADDRESS TO LISTEN command to the device that will receive the data messages.
2. The controller sends an ADDRESS TO TALK command to the 2075. Then the data message transmission occurs as would any normal data exchange.

To configure the 2075 to send data messages while in this mode, use the following steps:

1. Set the 2075 to Normal TALKER/LISTENER mode by pressing:

   SPEC FUNC   40.0   ENTER

   This step is not necessary if the 2075 has just been powered-on because 40.0 is the default mode after power-on.
2. Send the necessary GPIB codes (device messages) to the 2075 to configure it for the desired measurement. Refer to paragraph 4-9 and Tables 4-3 and 4-4.
3. Send the appropriate GPIB code (F0 through F6) to select the desired format and contents of the data messages. Refer to Table 4-3.
4. Determine the correct program statement needed by the controller to receive data from the 2075.
5. After the data is received, unaddress the 2075. If this is not done, it will remain in the active talker state and repeatedly try to output data to the bus after each measurement cycle.

The following program example illustrates the correct procedure using an HP 85 controller programmed in BASIC. The 2075 address is 8 and it is tuned to 100 MHz. Special Function 40.0 is already in effect.

```
100 OUTPUT 708 ;"F0"   (Send F0 for output
                        from Window C only)
110 ENTER 708 ; N      (Enter 708 - 1 message)
120 SEND 7 ; UNT       (Untalk)
```

The above 3 lines correspond to steps 3, 4, and 5 of the preceding procedure.

Data Message Format

Data messages are sent either as single messages (Special Functions 49.0, 49.1 or 49.2) or as multiple messages (Special Functions 49.3, 49.4, 49.5, or 49.6). The format for single messages is slightly different from that for multiple messages. A multiple message may have a separator between each single message in the group and uses a line terminator only at the end of the group. A single message has no separators but is also ended with a line terminator.

Single messages (GPIB codes F0, F1, or F2) are formatted as follows:

	Data	Line Terminator
Example:	5.65	[CR] [LF]

Note that the line terminator for the message is Carriage Return/Line Feed.

A multiple message (GPIB codes F3, F4, F5, or F6) is formatted as follows:

	Data	Separator	Data	Separator
Example:	10	,	45.23	,
	Data	**Line Terminator**		
	4.75	[CR] [LF]		

Note that the separator in the above example is a comma. The line terminator is Carriage Return/Line Feed. These are generated by the 2075. The terms are explained below.

Data is the numeric value in scaled decimal format with a fixed decimal point and no exponents. The units of measurement are implied by the current settings of the 2075. Frequency is always MHz, Gain or Noise Figure is dB or Ratio as previously selected, T_e is kelvins, and Y-Factor is dB or Ratio.

The Line Terminator is the delimiter used to indicate the end of a message. It is the Carriage Return/Line Feed sequence sent with the EOI line set TRUE.

The Separator is used to separate the individual data messages within the multiple message. Any ASCII character or string of characters can be selected to be the separator. This allows the normal comma (default) separator to be replaced to meet the requirements of any type of controller. If the data output is to a printer, for example, it would be convenient to define the separator as a string of spaces.

The program message ' ' (apostrophe/space/apostrophe) defines a space as the separator. The program message '##' would define two ##'s as the separator. It should be noted that some controllers accept only a comma as a data separator. Insure that any other separator which may be used is acceptable to the controller.

Error Messages

In situations where the measured data is invalid, the data message will contain an error message. The general form of the error message is XXXE10. The controller may change the form to X.XXE10. In some cases this type of message may be used as an end code.

Some examples of data messages which contain error messages are:

100,1.71+E10,5.55	The error message is Error 171 (Data not available for Gain)
350,1.70+E10,5.4	The error message is Error 170 (Measured data out of range)

Refer to Table 3-10 for a complete listing of error messages.

4-11. STATUS MESSAGES

Status messages are sent to the controller in the form of a Status Byte. The sequence of events is:

1. Some device on the bus initiates a Service Request by setting the SRQ (Service Request) line to TRUE.
2. The controller conducts a serial poll by having each device on the bus send a Status Byte. The controller reads each Status Byte to determine what device initiated the Service Request and why the device needs servicing.
3. The controller goes into a subroutine to service the device.

Service Request Message

When the 2075 requires service it sends the Service Request message to the controller by setting the SRQ line to TRUE. A special function determines what condition will cause the 2075 to request service from the controller. The table shown below lists the special function codes which determine what condition will cause the 2075 to request service. These special functions are mutually exclusive, that is, only one should be selected.

SPECIAL FUNCTION	GPIB CODES	CONDITION CAUSING SRQ
42.0	NI	All SRQ's are disabled
42.1	RA	SRQ on DATA READY
43.0	SRQ	Disable
43.1	RC	SRQ on CALIBRATION COMPLETE
45.0	SRQ	Disable
45.1	RT	SRQ on READY TO TUNE
46.0	SRQ	Disable
46.1	RI	SRQ on INSTRUMENT ERROR

The 2075 will not generate an SRQ unless one of these has been selected. To select one of these, send the appropriate GPIB code to the 2075. To disable, set the special function to its .0 value or send the equivalent GPIB code. It is recommended that the 2075 be placed in HOLD (GPIB code: T1) prior to enabling an SRQ condition. This will prevent the 2075 from sending an SRQ before the controller is ready to handle it. After the SRQ condition has been enabled, send the GPIB code T0 to return the 2075 to continuous measurement cycle.

Status Byte

When the 2075 requires the attention of the controller it sets the SRQ line TRUE. The controller then conducts a serial poll and reads the Status Byte from each device on the bus. After reading all the Status Bytes, the controller knows what device set the SRQ line TRUE, and what condition in that device requires servicing.

The format of the Status Byte of the 2075 is shown:

The appropriate bits are set to 1 when the condition is TRUE.

After the status message (Status Byte) has been sent it will be cleared if the 2075 receives one of the following messages from the controller:

SERIAL POLL DISABLE
ABORT
CLEAR

The flowchart of Figure 4-4 shows how data is collected using the Data Ready SRQ in Test Configuration 1.

Figure 4-5 is a sample program used for data collection in Test Configuration 1 with SRQ on Data Ready and an HP 85 as the system controller.

Figure 4-6 gives an example of measurement results obtained from running the program in Figure 4-5.

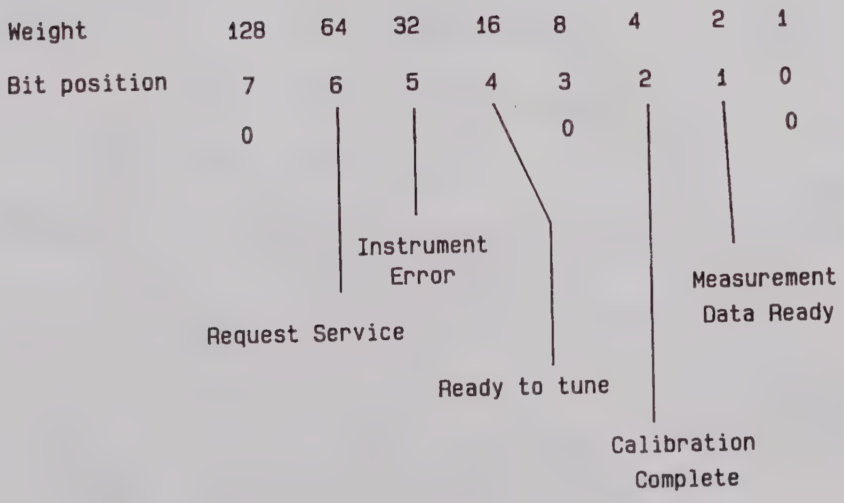

Weight
128
64
32
16
8
4
2
1
Bit position
7
6
5
4
3
2
1
0
0
0
0
Instrument Error
Measurement Data Ready
Request Service
Ready to tune
Calibration Complete

Figure 4-3. STATUS BYTE

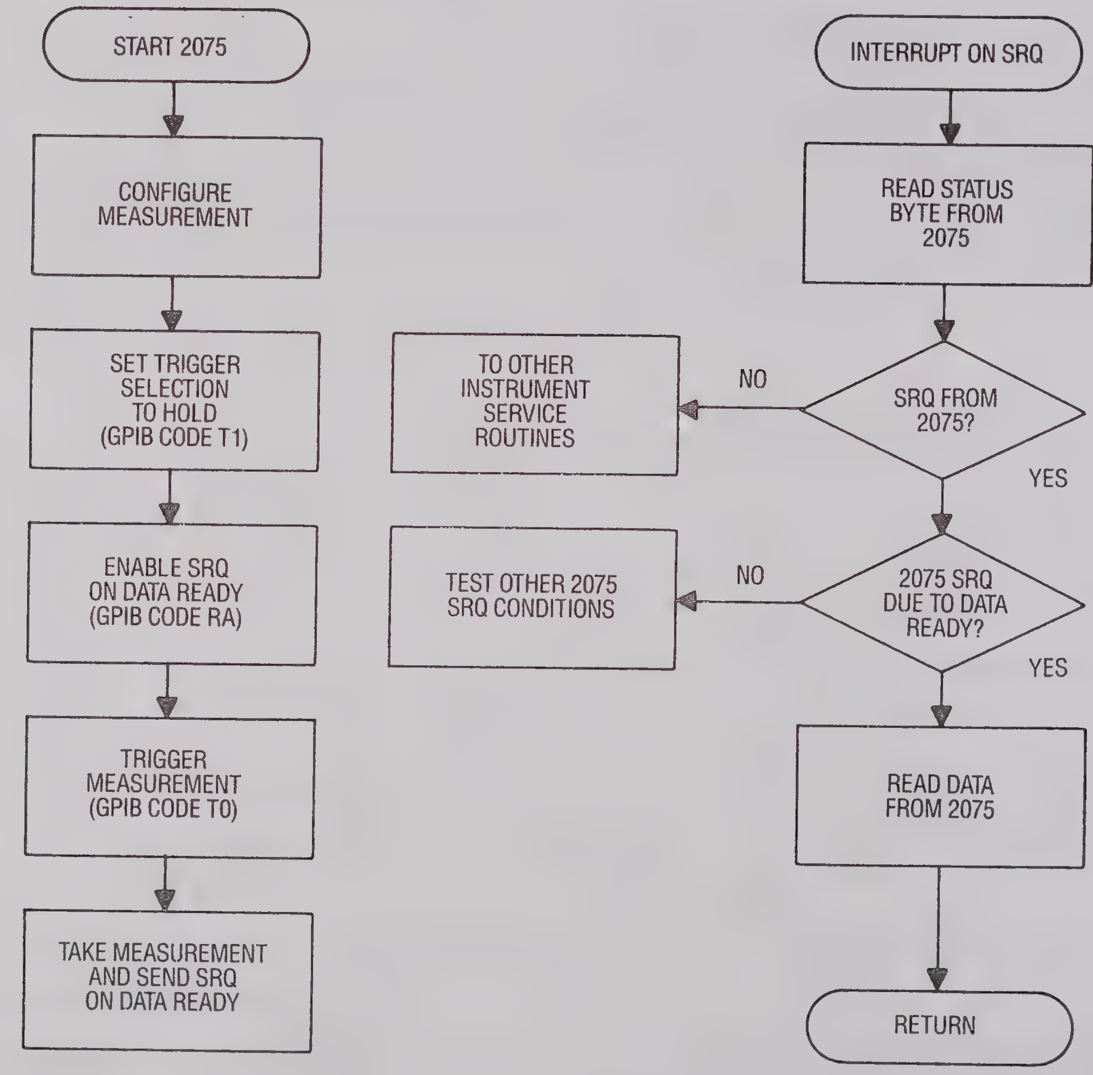

START 2075
CONFIGURE MEASUREMENT
SET TRIGGER SELECTION TO HOLD (GPIB CODE T1)
ENABLE SRQ ON DATA READY (GPIB CODE RA)
TRIGGER MEASUREMENT (GPIB CODE T0)
TAKE MEASUREMENT AND SEND SRQ ON DATA READY
INTERRUPT ON SRQ
READ STATUS BYTE FROM 2075
SRQ FROM 2075?
NO
TO OTHER INSTRUMENT SERVICE ROUTINES
YES
2075 SRQ DUE TO DATA READY?
NO
TEST OTHER 2075 SRQ CONDITIONS
YES
READ DATA FROM 2075
RETURN

Figure 4-4. FLOWCHART SHOWING DATA COLLECTION IN TEST CONFIGURATION 1 USING DATA READY SRQ

```
 10 !   PROGRAM TO DEMO SRQ
 20 !   ON DATA READY
 30 !   TRIGGED MEASUREMENT
 40 !
 50 !
 60 !   NORMAL NOISE MEASUREMENT
 70 !   FREQENCY OF MEAS 500 MHZ
 75 !   AND 600 MHZ
 80 !   SMOOTHING = 32
 90 !   DISPLAYS A AND C READ
100 !   PRINT DATA TO THERM PRT
110 !
120 ! FIRST STEP:
130 ! SET UP INTERRUPT
140 ! INITIALIZE OF HP 85
150 ON INTR 7 GOSUB 1000
160 ENABLE INTR 7;8
170 !
180 ! SECOND STEP:
190 ! COFIGURE 2075 MEASUREMENT
200 !
210 ! TUNE TO 500 MHZ
220 OUTPUT 708 ;"FR 500 MZ"
230 !
240 ! SET SMOOTHING FACTOR
250 !
260 OUTPUT 708 ;"S5"
270 !
280 ! MEASURE NOISE FIGURE

290 OUTPUT 708 ;"NF"
300 !
310 ! SET DATA OUTPUT FORMAT
320 !
330 OUTPUT 708 ;"F4"
340 ! SEND TRIGGER CODE(HOLD)
350 !
360 OUTPUT 708 ;"T1"
370 !
380 !
390 ! WE ARE NOW READY TO MAKE
400 ! OUR MEASUREMENTS
410 !
420 ! STEP 3 SEND SRQ ON DATA RD
    Y430 !
430 !
440 OUTPUT 708 ;"RA"
450 !
460 ! SEND TRRIGGER MESSAGE
470 ! AND PROCESS OTHER ROUTINES
480 ! UNTILL SRQ CAUSES INTERUPT
490 OUTPUT 708 ;"T0"
495 T=1
500 IF T<3 THEN GOTO 500
510 END
```

Figure 4-5. PROGRAMMING EXAMPLE FOR DATA COLLECTION IN TEST CONFIGURATION 1 USING SRQ ON DATA READY WITH HP85 CONTROLLER

```
520 !
530 !
540 !
900 ! SRQ SERVICE ROUTINES
910 ! IF SRQ THEN:
920 ! WHO SENT SRQ ?
930 ! WHY WAS SRQ SENT?
940 ! PROCESS INFOMATION AS
950 ! NECESSARY
960 !
970 !
980 ! STEP 1: WHO SENT SRQ
990 ! DO SERIAL POLL
1000 S=SPOLL(708)
1010 IF BIT(S,6)=1 THEN GOTO 200
     0
1020 ! ELSE POLL OTHER DEVICES
1030 ! ON BUSS
1040 GOTO 6050
2000 PRINT "2075 SENT SRQ"
2010 PRINT "TESTING CAUSE"
2020 IF BIT(S,1)=1 THEN GOTO 300
     0
2030 ! TEST OTHER BITS FOR
2040 ! OTHER POSSIBLE SRQ
2050 ! CAUSES
3000 PRINT "2075 SENT DATA READY
      SRQ"
3010 PRINT "READING 2075 DATA"
3020 ENTER 708 ; F,N
3030 SEND 7 ; UNT
3032 ! DISABLE DATA RDY SRQ
3034 OUTPUT 708 ;"NI"
3040 PRINT "DATA RECORD"
3050 PRINT "FREQ=",F
3060 PRINT "NOISE FIG=",N
3080 ! INITIALIZE HP 85 STATUS
3090 STATUS 7,1 ; S1
4000 ENABLE INTR 7;8
4010 IF T=1 THEN GOTO 6000
5000 IF T=2 THEN GOTO 6030
6000 ! TUNE TO NEXT FREQ AND
6010 ! RE ENABLE SRQ ON DATA
6020 ! READY
6030 T=T+1
6032 IF T=3 THEN GOTO 6050
6035 OUTPUT 708 ;"FR 600 MZ"
6040 IF T=2 THEN OUTPUT 708 ;"RA
     "
6050 RETURN
```

Figure 4-5. PROGRAMMING EXAMPLE FOR DATA COLLECTION IN TEST CONFIGURATION 1 USING SRQ ON DATA READY WITH HP85 CONTROLLER (Continued)

```
2075 SENT SRQ
TESTING CAUSE
2075 SENT DATA READY SRQ
READING 2075 DATA
DATA RECORD
FREQ=                        500
NOISE FIG=                   6.06
2075 SENT SRQ
TESTING CAUSE
2075 SENT DATA READY SRQ
READING 2075 DATA
DATA RECORD
FREQ=                        600
NOISE FIG=                   6.38
```

Figure 4-6. SAMPLE RESULTS FROM RUNNING PROGRAM IN FIGURE 4-5

Synchronizing the Controller and the External Local Oscillator

When an external controller is used to control the 2075 and the external local oscillator tuning, as may be done in Test Configurations 2, 4, and 6, it is necessary to synchronize the controller with the measurement cycle of the 2075. This synchronization is accomplished by the structure of the controller program, and varies according to the type of SRQ being used. Using Special Functions 42.0 through 46.0, the 2075 can be configured to initiate an SRQ on Data Ready, Calibration Complete, or Ready to Tune. The following information shows how the program must be structured to achieve sychronization when the 2075 is configured for SRQ on Ready to Tune. Following that, information is given to show the correct program structure when the 2075 is configured for SRQ on Data Ready.

Figure 4-7 shows a typical swept measurement setup for Test Configuration 2.

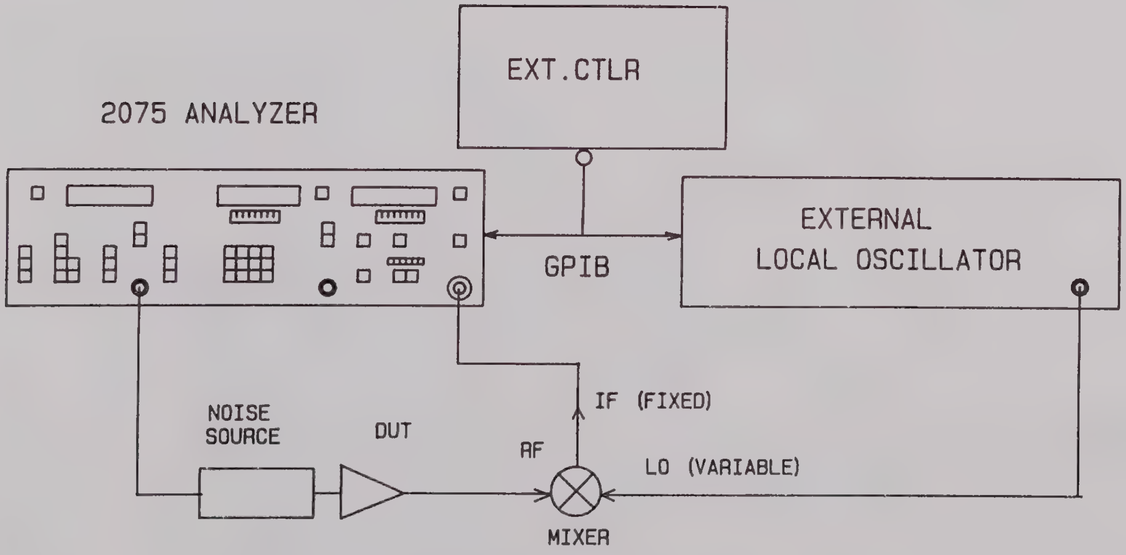


Figure 4-7. SETUP IN TEST CONFIGURATION 2

The following steps illustrate the general form of the controller program when the 2075 is configured to initiate an SRQ on Ready to Tune. (SRQ on Ready to Tune means that the 2075 will send a service request to the controller when the 2075 is ready to tune to the next frequency step of a sweep.) This form is also shown in the flowchart of Figure 4-8.

General form of the controller program for SRQ on Ready to Tune is:

1. Place the 2075 in HOLD mode (T1).
2. Send all parameters required to do the measurement to the 2075.
3. Send the required settling time (T settle) to the 2075. T settle should be equal to the local oscillator settling time (the time required for the LO to settle after tuning to a new frequency) plus any overhead time taken by the controller to set up the external local oscillator frequency. It is a good idea to include some extra time in T settle to allow some margin.
4. Send the code that configures the 2075 for SRQ on Ready to Tune (RT).
5. Send the single sweep command to the 2075.
6. If sweep is not completed, wait for the SRQ from the 2075.
7. Upon receiving the SRQ, read the Status Byte of the 2075. If Bit 4 of the Status Byte is set to 1, then send the command to tune the external local oscillator to the new frequency. (Any SRQ sets Bit 6 of the Status Byte and the Ready to Tune SRQ also sets Bit 4.)
8. Address the 2075 to Talk and then read the measurement data.
9. If sweep is completed then end. Otherwise, return to step 6.

The main point in the above steps is that after the Status Byte is read, the 2075 will wait for the amount of time determined by T settle, and then make the next measurement. The flowchart of Figure 4-8 illustrates the correct program structure.

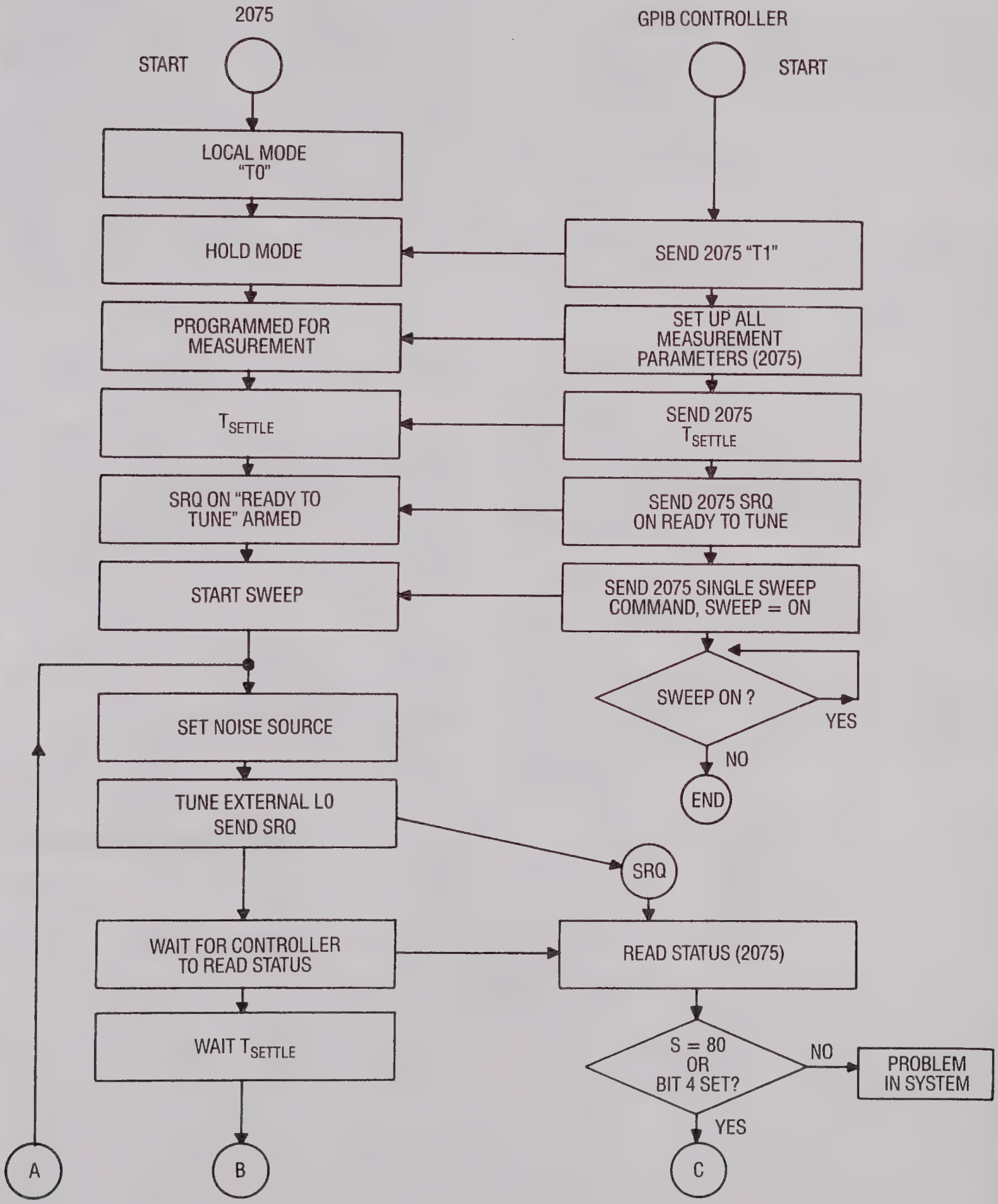

2075
GPIB CONTROLLER
START
START
LOCAL MODE "T0"
HOLD MODE
SEND 2075 "T1"
PROGRAMMED FOR MEASUREMENT
SET UP ALL MEASUREMENT PARAMETERS (2075)
T_{SETTLE}
SEND 2075 T_{SETTLE}
SRQ ON "READY TO TUNE" ARMED
SEND 2075 SRQ ON READY TO TUNE
START SWEEP
SEND 2075 SINGLE SWEEP COMMAND, SWEEP = ON
SWEEP ON ?
YES
NO
END
SET NOISE SOURCE
TUNE EXTERNAL LO SEND SRQ
SRQ
WAIT FOR CONTROLLER TO READ STATUS
READ STATUS (2075)
WAIT T_{SETTLE}
S = 80 OR BIT 4 SET?
NO
PROBLEM IN SYSTEM
YES
A
B
C

Figure 4-8. FLOWCHART FOR SRQ ON READY TO TUNE

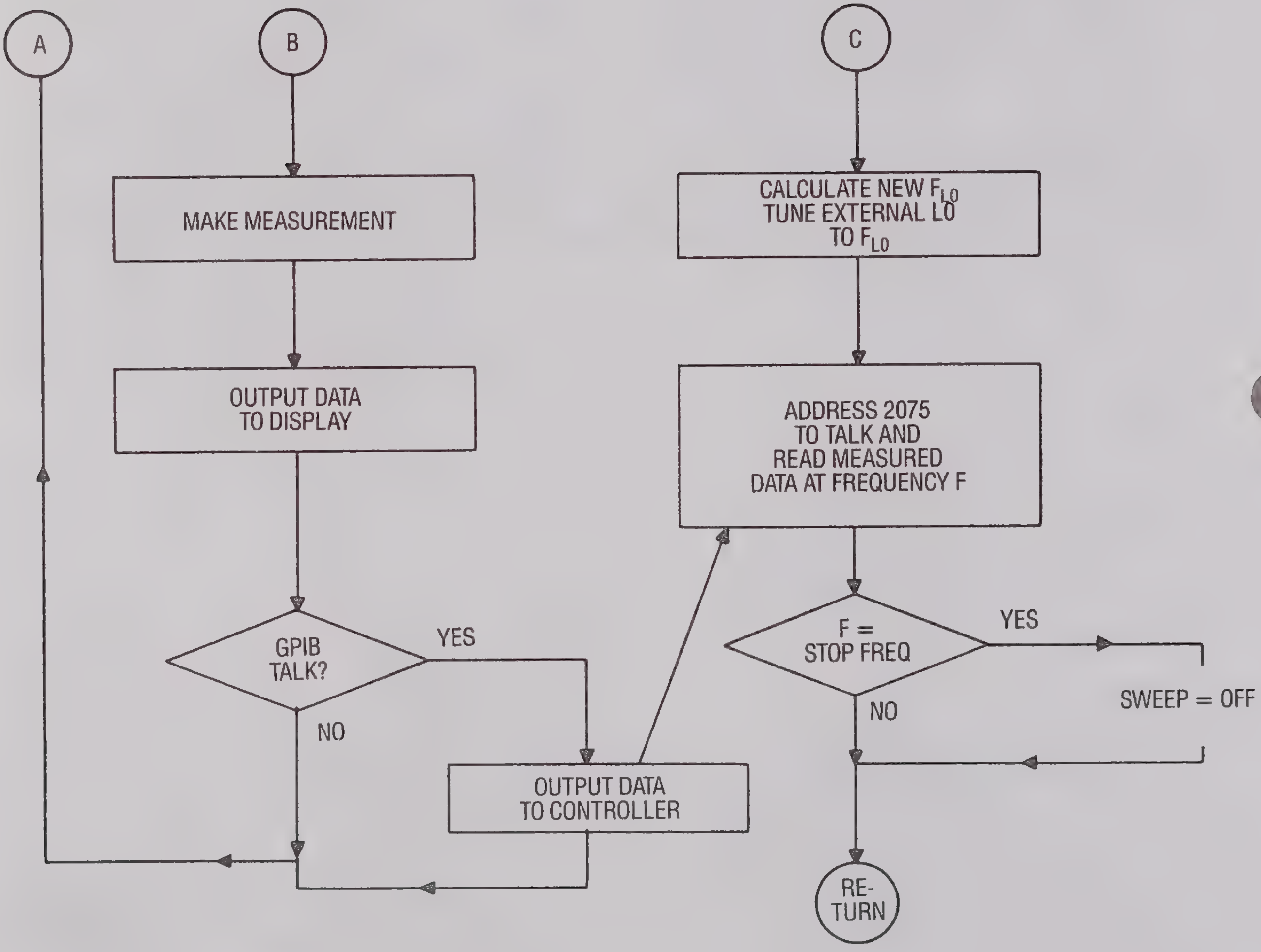

A
B
C
MAKE MEASUREMENT
OUTPUT DATA TO DISPLAY
GPIB TALK?
YES
NO
OUTPUT DATA TO CONTROLLER
CALCULATE NEW F_{LO}
TUNE EXTERNAL LO TO F_{LO}
ADDRESS 2075 TO TALK AND READ MEASURED DATA AT FREQUENCY F
F = STOP FREQ
YES
NO
SWEEP = OFF
RE-TURN

Figure 4-8. FLOWCHART FOR SRQ ON READY TO TUNE (Continued)

When the 2075 is configured to generate an SRQ on Data Ready, the form of the controller program must be different from the form used with SRQ on Ready to Tune. The following steps show how the program should be structured to achieve the correct synchronization of the controller and the 2075 when using SRQ on Data Ready. (SRQ on Data Ready means that the 2075 will send a service request to the controller when the data from the measurement just made is ready to be transmitted.) This example applies to Test Configurations 2, 4 or 6. An example of Test Configuration 2 is shown in Figure 4-7.

1. Place the 2075 in the HOLD mode (T1).
2. Send all parameters required to do the measurement to the 2075.
3. Send the required settling time (T settle) to the 2075. T settle should be equal to the local oscillator settling time (the time required for the LO to settle after tuning to a new frequency) plus any overhead time taken by the controller to set up the external local oscillator frequency. It is a good idea to include some extra time in T settle to allow some margin.
4. Send the code that configures the 2075 for SRQ on Data Ready (RA).
5. Send the code that tunes the external local oscillator to the sweep start frequency.
6. Send the single sweep command to the 2075.
7. Wait for the SRQ from the 2075.
8. Upon receiving the SRQ, read the Status Byte of the 2075. If Bit 1 of the Status Byte is set to 1, then proceed with the next step. (Any SRQ sets Bit 6 of the Status Byte and the Data Ready SRQ also sets Bit 1.)
9. Send the command to tune the external local oscillator to the next frequency.
10. Address the 2075 to talk and then read the measurement data. The data being read in this step is from the previous measurement that was executed before step 9 was done.
11. If sweep is completed then end. Otherwise, return to step 7.

The main point in the above is that the data from the previous measurement frequency is ready to be read when the 2075 sends the SRQ to the controller. If the controller program does not do step 8 before doing step 9, the controller and the 2075 will go into a race with each other.

The flowchart of Figure 4-9 illustrates the correct program structure to synchronize the controller and the 2075 when using SRQ on Data Ready.

The sample program of Figure 4-10 synchronizes the controller and the 2075 during calibration using the SRQ on Ready to Tune. It synchronizes the two instruments during measurement using the SRQ on Data Ready.

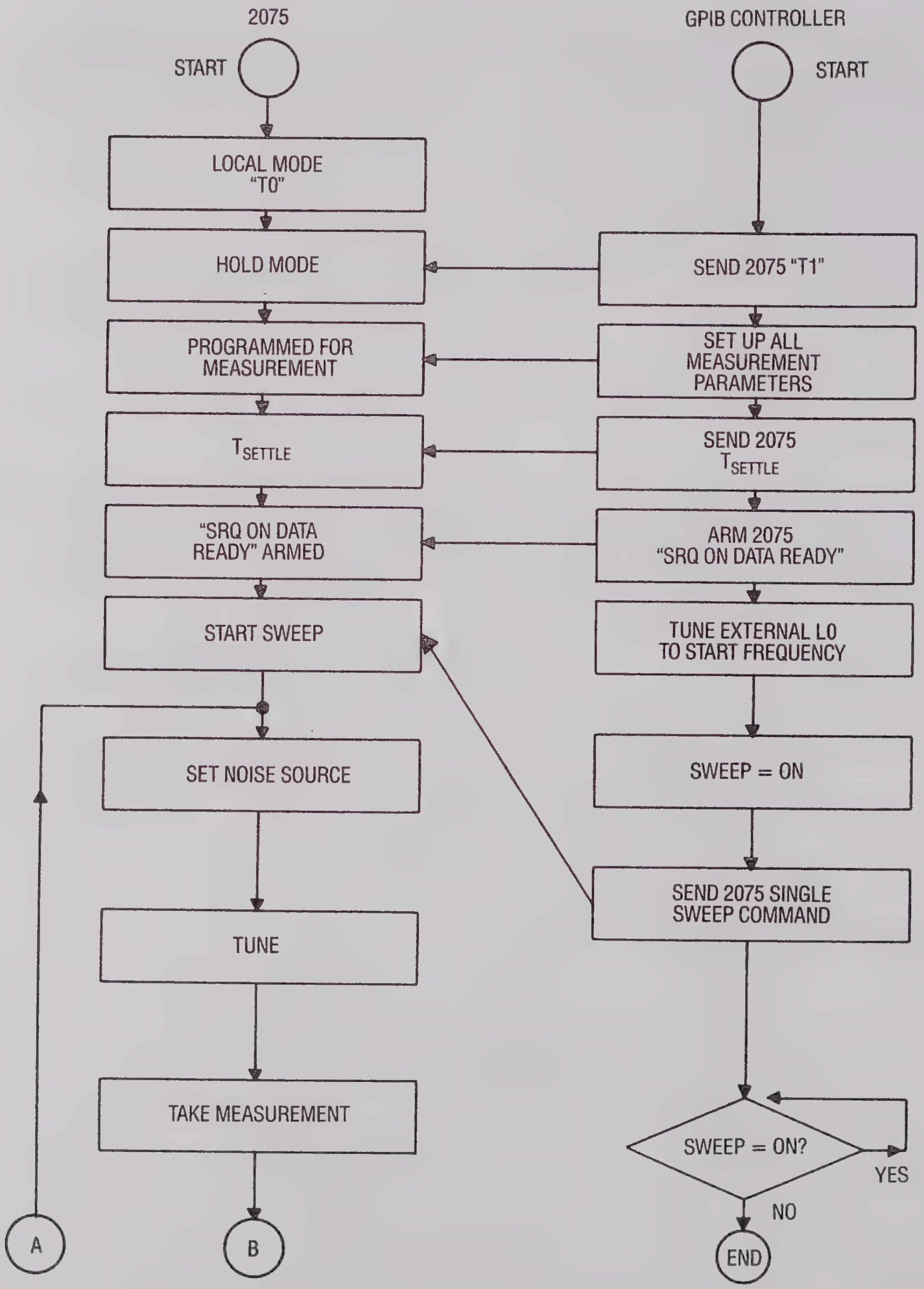

2075
START
LOCAL MODE "T0"
HOLD MODE
PROGRAMMED FOR MEASUREMENT
T_{SETTLE}
"SRQ ON DATA READY" ARMED
START SWEEP
SET NOISE SOURCE
TUNE
TAKE MEASUREMENT
A
B
GPIB CONTROLLER
START
SEND 2075 "T1"
SET UP ALL MEASUREMENT PARAMETERS
SEND 2075 T_{SETTLE}
ARM 2075 "SRQ ON DATA READY"
TUNE EXTERNAL LO TO START FREQUENCY
SWEEP = ON
SEND 2075 SINGLE SWEEP COMMAND
SWEEP = ON?
YES
NO
END

Figure 4-9. FLOWCHART FOR SRQ ON DATA READY

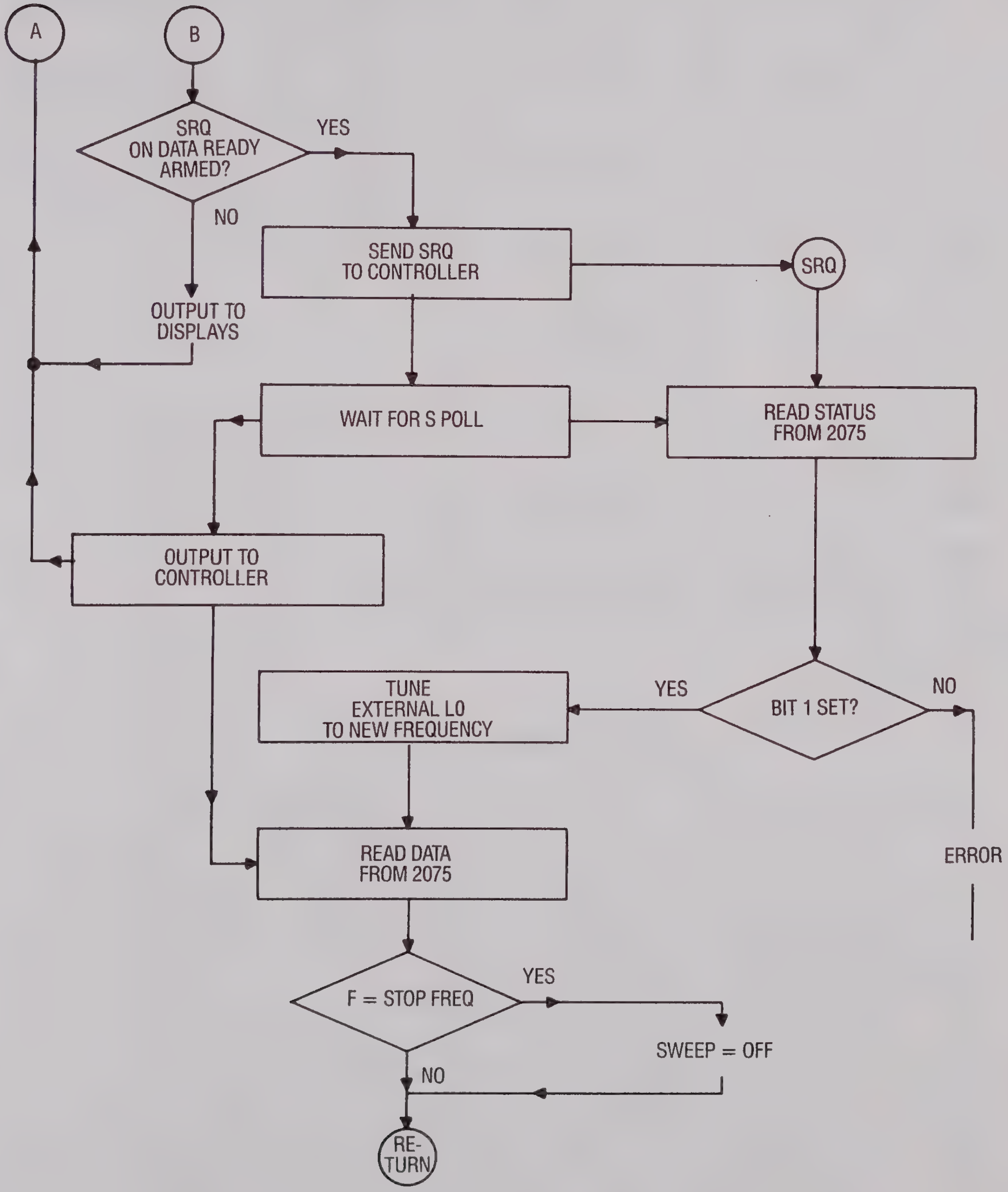

A
B
SRQ ON DATA READY ARMED?
YES
NO
SEND SRQ TO CONTROLLER
SRQ
OUTPUT TO DISPLAYS
WAIT FOR S POLL
READ STATUS FROM 2075
OUTPUT TO CONTROLLER
TUNE EXTERNAL LO TO NEW FREQUENCY
YES
BIT 1 SET?
NO
READ DATA FROM 2075
ERROR
F = STOP FREQ
YES
SWEEP = OFF
NO
RE-TURN

Figure 4-9. FLOWCHART FOR SRQ ON DATA READY (Continued)

This program uses Test Configuration 2 - Double Sideband. The Controller is on HP 85 and the External Local Oscillator is a Wiltron 6600 series sweep generator.

During Calibration, the Controller synchronizes the L.O. tuning and the 2075 using the READY TO TUNE SRQ interrupt (RA).

During measurement the Controller synchronizes the L.O. tuning and the 2075 using the DATA READY SRQ interrupt (RT).

```
 10 DISP "THIS IS THE MEASUREMEN
    T PROGRAM"
 20 DISP "FOR A MICROWAVE AMPLIF
    IER USING"
 30 DISP "THE SWEPT LO, DSB TECH
    NIQUE"
 40 DISP @ DISP "SET THE 2075 BU
    S ADDRESS TO 8"
 50 DISP @ DISP "SET THE 6600 BU
    S ADDRESS TO 19"
 60 DISP @ DISP "PRESS K4, 'CONT
    ' WHEN READY"
 70 ON KEY# 4,"CONT" GOTO 100
 80 KEY LABEL
 90 GOTO 90
100 CLEAR @ BEEP
110 DISP "START FREQUENCY(MHZ)="
    ;
120 INPUT F1
130 DISP @ DISP "STOP FREQUENCY(
    MHZ)=";
140 INPUT F2
150 DISP @ DISP "STEP SIZE(MHZ)=
    ";
160 INPUT F0
170 DISP @ DISP "IF (MHZ)=";
180 INPUT I
190 DISP @ DISP "LO POWER(DBM)="
    ;
200 INPUT P0
210 IF P0>10 THEN 270
220 DISP @ DISP "SMOOTHING INCRE
    MENT=";
230 INPUT E
240 GOSUB 300
250 GOSUB 500
260 GOTO 570
270 CLEAR @ BEEP
280 DISP "MAX LO POWER IS +10DBM
    "
290 GOTO 190
300 S=SPOLL(708)
310 OUTPUT 708 ;"NI,T1,LE,NF,F6,
    D2,A0,N0,P2,B1,RF,C1,NS,GF,D
    F"
320 OUTPUT 708 ;"FA";F1;"MZ"
330 OUTPUT 708 ;"FB";F2;"MZ"
340 OUTPUT 708 ;"SS";F0;"MZ"
350 OUTPUT 708 ;"IF";I;"MZ"
360 OUTPUT 708 ;"ST50ET"
370 IF E=0 THEN E$="S0"
380 IF E=1 THEN E$="S1"
390 IF E=2 THEN E$="S2"
400 IF E=3 THEN E$="S3"
410 IF E=4 THEN E$="S4"
420 IF E=5 THEN E$="S5"
430 IF E=6 THEN E$="S6"
440 IF E=7 THEN E$="S7"
450 IF E=8 THEN E$="S8"
460 IF E=9 THEN E$="S9"
470 OUTPUT 708 ;E$
480 OUTPUT 708 ;"T0"
490 RETURN
```

User enters measurement parameters.

Depends on L.O. used

Clear 2075 Status Register (optional here)

Set up the 2075

Figure 4-10. SAMPLE PROGRAM

```
500 OUTPUT 719 ;"RF0,IL1,FM0,MK0"   ┐
510 F=F1                             │
520 OUTPUT 719 ;"CF0"                │
530 OUTPUT 719 ;"F0";F;"MH"          ├─ Set up the L.O.
540 OUTPUT 719 ;"LVL";P0;"DM"        │
550 OUTPUT 719 ;"RF1"                ┘
560 RETURN
570 F=F1 @ C=1
580 STATUS 7,1 ; S ──────────────── Clear HP 85 Status Register
590 ENABLE INTR 7;8
600 ON INTR 7 GOTO 720
610 CLEAR @ BEEP
620 DISP "CONNECT THE NOISE GENE
    RATOR TO"
630 DISP "THE MIXER INPUT"
640 DISP @ DISP "PRESS k4,'CONT'
     WHEN READY"
650 ON KEY# 4,"CONT" GOTO 680
660 KEY LABEL
670 GOTO 670
680 CLEAR @ DISP @ DISP @ DISP @
     DISP
690 DISP "*2nd STAGE NOISE CAL I
    N PROGRESS"
700 OUTPUT 708 ;"RT,CA" ─────────── Enable READY TO TUNE SRQ
                                     and begin Calibration
710 GOTO 710
720 S=SPOLL(708)
730 IF BIT(S,4)=0 THEN GOTO 820 ─── READY TO TUNE SRQ sets bit 4
740 OUTPUT 719 ;"CF0,F0";F;"MH"      of the status register
750 F=F+F0
760 IF F=F2+F0 THEN C=C+1 @ F=F1 ── "C" is a pointer which keeps track
770 IF F>F2 THEN F=F2                of which RF attentuator state is
780 IF C=4 THEN GOTO 880             being calibrated.
790 STATUS 7,1 ; S                   (Alternately, could enable (RC) which
800 ENABLE INTR 7;8                  sends SRQ interrupt when Calibration
810 GOTO 810                         is complete. Sets bit 2 of the
820 CLEAR @ BEEP               ┐     status register)
830 DISP "NO SRQ"              │
840 DISP "SOMETHING SCREWED UP"│
850 DISP "CHECK CABLES,ADDRESS,E
    TC."                       ├─── Error routine
860 DISP @ DISP "PRESS k4, 'CONT
    ' TO RESTART"              │
870 ON KEY# 4,"CONT" GOTO 10   ┘
880 CLEAR @ BEEP
890 DISP "*2nd STAGE CAL COMPLETE"
900 WAIT 1000
910 OUTPUT 708 ;"NI" ───────────── Disable SRQ's
920 S=SPOLL(708) ───────────────── Clear 2075 status register (optional here)
930 F=F1 ───────────────────────── Prepare for measurement
940 OUTPUT 719 ;"CF0,F0";F;"MH"
950 DISP @ DISP "CONNECT THE DUT
     BETWEEN THE"
960 DISP "NOISE GENERATOR AND TH
    E MIXER"
970 DISP @ DISP "PRESS k4,'CONT'
     WHEN READY"
980 ON KEY# 4,"CONT" GOTO 1010
990 KEY LABEL
1000 GOTO 1000
1010 PRINT @ PRINT @ CLEAR
1020 PRINT "     ** AMPLIFIER TES
     T DATA  **"
```

Figure 4-10. SAMPLE PROGRAM (Continued)

```
1030 PRINT @ PRINT "FREQ
      GAIN      NOISE FIG"
1040 PRINT "(Mhz)            (dB)
            (dB)"
1050 F=F1
1060 OUTPUT 719 ;"CF0.F0":F:"MH"
1070 STATUS 7,1 ; S
1080 ON INTR 7 GOTO 1120
1090 ENABLE INTR 7;8
1100 OUTPUT 708 ;"T1,RA,SG"
1110 GOTO 1110
1120 S=SPOLL(708)
1130 IF BIT(S,1)=0 THEN GOTO 820
1140 F=F+F0
1150 IF F>F2 THEN F=F2
1160 OUTPUT 719 ;"CF0,F0";F;"MH"
1170 WAIT 50
1180 ENTER 708 ; X,Y,Z
1190 SEND 7 ; UNT
1200 IMAGE 5D,7X,M2D.2D,9X,2D.2D
1210 PRINT USING 1200 ; X,Y,Z
1220 IF F=F2+F0 OR X=F2 THEN GOT
     O 1260
1230 STATUS 7,1 ; S
1240 ENABLE INTR 7;8
1250 GOTO 1250
1260 OUTPUT 708 ;"NI,NG,T0"
1270 PRINT @ PRINT @ PRINT @ PRI
     NT @ PRINT @ PRINT
1280 OFF KEY# 4
1290 CLEAR @ BEEP
1300 DISP "TEST COMPLETE"
1310 DISP "PRESS THE APPROPRIATE
      KEY BELOW"
1320 DISP "FOR NEXT ACTION"
1330 DISP
1340 DISP "k1";TAB(10);"REPEAT T
     EST"
1350 DISP "k2";TAB(10);"RECAL 2n
     D STAGE"
1360 DISP "k3";TAB(10);"NEW TEST
     "
1370 DISP "k4";TAB(10);"END TEST
     ING"
1380 ON KEY# 1,"REPEAT" GOTO 1440
1390 ON KEY# 2,"RE-CAL" GOTO 1470
1400 ON KEY# 3,"NEW" GOTO 1500
1410 ON KEY# 4,"END" GOTO 1530
1420 KEY LABEL
1430 GOTO 1430
1440 OFF KEY# 1 @ OFF KEY# 2 @ O
     FF KEY# 3 @ OFF KEY# 4
1450 CLEAR @ BEEP
1460 GOTO 950
1470 OFF KEY# 1 @ OFF KEY# 2 @ O
     FF KEY# 3 @ OFF KEY# 4
1480 CLEAR @ BEEP
1490 GOTO 570
1500 OFF KEY# 1 @ OFF KEY# 2 @ O
     FF KEY# 3 @ OFF KEY# 4
1510 CLEAR @ BEEP
1520 GOTO 100
1530 END
```

Clear Controller Status Register

Enable DATA READY SRQ. Single Sweep allowed in measurement hold mode.

Data Ready sets bit 1 of 2075 Status Register

Update L.O. frequency before reading data from 2075. 2075 will not make another measurement until data has been read.

Tell 2075 to stop sending status register.

Figure 4-10. SAMPLE PROGRAM (Continued)

SECTION 5

PERFORMANCE VERIFICATION TESTS

5-1. INTRODUCTION

This section of the manual contains Performance Verification Tests which are used to verify that the 2075 is functioning in accordance with the specification requirements listed in Section 1. These procedures are normally performed upon receipt of the instrument, after repair or adjustment, or when the performance of the 2075 is suspect. These procedures should also be performed every six months to verify the continued optimum performance of the 2075.

5-2. TEST EQUIPMENT REQUIRED

The test equipment required for conducting the performance verification tests is listed in Table 5-1. For each item listed, the recommended manufacturer and model number is shown where appropriate. Minimum or critical parameters are also shown. Generally, it is desirable to use equipment with an accuracy four times greater than the parameter being tested. However, for the most part, these tests are internal checks performed by the 2075 and, therefore, accuracy of other test equipment is not important except for the Digital Voltmeter.

Test equipment warm-up is not critical for the first tests in this group. However, the 2075 should be warmed-up for at least 10 minutes before performing the Final Detector Linearity Test.

Table 5-1. Test Equipment Requirements for Performance Verification Testing

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Digital Voltmeter	5½ digits	Fluke 8840A
Dual Channel Oscilloscope	Z-Axis blanking on positive-going TTL input	Tektronix 2213A
Calibrated Noise Source		EATON 7618E or 7626
Test Cables with BNC Connectors		

5-3. PERFORMANCE VERIFICATION PROCEDURES

The Performance Verification Procedures are listed in Table 5-2. It is recommended that they be performed in the sequence listed. Access to the interior of the 2075 is not required for performance of these procedures. All tests are to be done at room temperature.

Table 5-2. Performance Verification Tests

PROCEDURE	PARAMETER OR FUNCTION VERIFIED
Power-on Test	Self-Test Functions
Noise Drive Voltage Test	Noise Drive Voltage Level
IF Attenuators Calibration	Calibration of IF Attenuators
Final Detector Bias Test	Bias Voltage Level
Second Stage Calibration	Noise Figure versus Calibration Steps
Final Detector Linearity Test	Detector Linearity

5-4. POWER-ON TEST

This is a series of internal self-checks performed by the 2075 upon power-up. The unit checks the operation of its Math Processor, RAM, ROM, GPIB Controller, and its DMAC (Direct Memory Access Controller). Finally, the 2075 performs an FCAL (Frequency Calibration) to ensure the accuracy of its frequency tuning. No test equipment is required for this procedure.

Perform the following steps:

1. Connect the 2075 to an AC power source of the appropriate voltage.
2. Remove any devices connected to the RF INPUT.
3. Place the POWER switch in the ON position.
4. The following correct indications should be observed:
   a. All front panel red LED's and indicators light briefly.
   b. The words SELF and TEST appear in Windows A and B respectively, while the numbers 1 through 6 appear sequentially in Window C.

   NOTE

   Window A is the rectangular display on the left which is labeled FREQUENCY MHz. Window B is the display in the middle and is labeled GAIN. Window C is the one on the right labeled NOISE FIGURE.

   c. The message FCAL appears for several seconds in Window B.
   d. A frequency value is displayed in Window A and some numeric value will flash in Window C.
5. Press the **PRESET** key. The message FCAL will appear momentarily in Window B and then the frequency value in Window A may change.
6. After these steps have been completed, if no error messages have appeared, the 2075 has successfully completed the Power-up Test.

5-5. NOISE DRIVE VOLTAGE TEST

This procedure measures the DC voltage at the NOISE DRIVE output connector on the front panel of the 2075. This voltage should be +28.00 volts plus or minus .050 volts.

A 5½ digit, digital voltmeter is required.

Eaton Corporation
Electronic Instrumentation Division
5340 Alla Road
Los Angeles, California 90066
(213) 822-3061

February 4, 1987

GTE Government Systems
100 Ferguson Drive
Mountain View, California 94043

Attention: Jim Simon, M/S 4G10

Dear Mr. Simon:

This letter is to verify that there has been a change in the allowable detector voltage range mentioned in step 6 of the Final Detector Bias Test of section 5-7 in the 2075 Operating Manual.

The voltage limits of 16 to 24 mV have been changed to 12-28 mV. This change will be included in the new 2075 maintenance manual. If you have any questions feel free to call me at 213/822-3061.

Sincerely,

W. Gary Grimes

W. Gary Grimes

WGG/jk

1. Set the POWER switch to the ON position.
2. Remove any devices connected to the RF INPUT.
3. Press:

   SPEC FUNC   20.2   ENTER

   This special function causes the 2075 to apply the noise drive voltage to the BNC connector. The green NOISE DRIVE LED will light.
4. Connect the DVM leads to the NOISE DRIVE connector and take the voltage reading.
5. The voltage should be + 28.00 volts DC ± .050 volts.
6. Press the ON/OFF key.
7. Verify that the green NOISE DRIVE LED is off and that the voltage at the NOISE DRIVE connector is less than + 1.0 volt DC.
8. This concludes the Noise Drive Voltage Test.

5-6. IF ATTENUATORS CALIBRATION

In this procedure the 2075 measures the changes in gain caused by adding different levels of internal IF attenuation and then stores those attenuator values.

No test equipment is required for this procedure.

1. Place the POWER switch in the ON position.
2. Remove any devices connected to the RF INPUT.
3. Press:

   SPEC FUNC   19.1   ENTER
4. The word CAL0 appears in Window B and the letters IF appear in Window C.
5. The words CAL1, CAL2, CAL3 and CAL4 will appear sequentially in Window B while the unit continues to calibrate its IF stages.
6. When a frequency value appears in Window A, and some numeric value begins flashing in Window C, this calibration procedure is successfully completed.

5-7. FINAL DETECTOR BIAS TEST

This procedure measures the bias voltage on the final detector.

No test equipment is required for this procedure.

1. Place the POWER switch in the ON position.
2. Press:

   SPEC FUNC   37.5   ENTER

   This causes the 2075 to place 55 dB of attenuation in its RF stage.
3. The value 55 dB should appear in Window B, and 0 dB should appear in Window C.
4. Press:

   SPEC FUNC   39.5   ENTER

   This causes the 2075 to place 45 dB of attenuation in its IF stages.
5. The value 45 dB will appear in Window C.
6. The value of the detector bias voltage is displayed in Window A. This voltage must be between ~~.016 and .024 volts (16 to 24 millivolts).~~ If the least significant digits of the display are changing too rapidly to read, add smoothing by pressing the **RIGHT ARROW** key several times.

   .012 & .028 (12 TO 28mv)
7. The test is complete at this point but the 2075 must be taken out of the test mode by completing the following steps.

   4/13/96

8. Press:

   SPEC FUNC   37.0   ENTER

9. Press:

SPEC FUNC | 39.0 | ENTER

10. Press the **F** key.

11. This concludes the Detector Bias Test procedure.

5-8. SECOND STAGE CALIBRATION

In the first part of this procedure frequencies and corresponding noise source ENR values are entered into an ENR table of the 2075 by the operator. Then the 2075 measures its own second stage noise figure at different frequencies and gain levels, and stores these values.

A calibrated noise source is required for this procedure.

Perform the following steps:

1. Select the noise source which will be used to make the measurements.

2. Apply AC power to the 2075.

3. Allow several seconds for the 2075 to complete its automatic power-up self tests. These are completed when the message FCAL has appeared in, and then disappeared from, Window B.

4. Press the **PRESET** key. Wait until the new FCAL message disappears from Window B, signifying that the frequency calibration is completed. Preset restores the control parameters to a set of known values.

5. Press:

SPEC FUNC | 5.1 | ENTER

This calls up, or activates, Table 1. The data about to be entered will be stored in Table 1 (5.2 would have called up Table 2 and 5.3 would have called up Table 3). The error message 104 may appear indicating that no data is currently stored. If so, it may be disregarded.

6. Press:

ENR

This places the 2075 in the mode which allows entry of the frequencies and ENR values. The red light in the center of the ENR key is illuminated. Also, the ENTER annunciator in Window A begins to blink signifying that the operator is required to enter a frequency.

7. Enter the first calibration frequency, in MHz, from the noise source calibration data sheet (for example, 10 MHz) by pressing:

10 | ENTER

The frequency just entered appears in Window A. The ENTER annunciator in Window B begins to blink signifying that the operator is required to enter the ENR value, in dB, for the frequency just entered.

8. Read the ENR value for the frequency just entered from the noise source calibration data sheet, or the inscribed label on the calibrated noise source. Enter this value by pressing:

numeric keys | ENTER

The value just entered appears in Window B. This completes the entries for the first frequency. The ENTER annunciator in Window A begins to blink, indicating that the next frequency should be entered.

9. Enter the next frequency, in MHz, from the noise source calibration data sheet by pressing:

numeric keys | ENTER

The frequency just entered appears in Window A. The ENTER annunciator in Window B begins to blink, signifying that the ENR value for that frequency should now be entered. ENR values are always entered in decibels.

10. Enter the ENR value by pressing:

    numeric keys ENTER

    The value just entered appears in Window B. Now the ENTER annunciator in Window A will start to blink again, indicating that the next frequency should be entered.

11. Continue to enter paired frequency and ENR values for all data points shown on the noise source calibration data sheet.

12. After all the entries have been made, use the **DOWN ARROW** and **UP ARROW** keys to examine the entries for correctness. Step down through the table by pressing or holding the **DOWN ARROW** key. Step up through the table by pressing or holding the **UP ARROW** key.

    To clear an erroneous entry, first display it using the up or down arrow keys and then press the **CLEAR** key. Both the frequency and the ENR value will be cleared. Then enter the correct value. The **ENTER** key can be used to toggle the ENTER annunciator back and forth between Window A and Window B. See paragraph 3-31 for more information.

    To clear the entire table, press:

    SHIFT CLEAR

13. Press:

    ENR

    This takes the 2075 out of the ENR table entry and display mode. The red light in the center of the **ENR** key will go out. This completes the entry of ENR data. Continue with the following steps to perform the Second Stage Calibration.

14. Connect the noise source to the RF INPUT connector and the NOISE DRIVE connector. Press:

    CALIB

15. The 2075 will now display an FCAL, CAL0, CAL1, CAL2, and CAL3 as it performs these steps of the calibration process.

16. During the CAL1, while the unit takes 20 MHz steps, verify that the noise figure displayed in Window C is less than 7.0 dB ± .001 dB/MHz from 10 MHz to 1850 MHz. The noise figure at 1850 MHz should be less than 8.85 dB. As the 2075 steps up to 1900 MHz, the noise figure may go above 8.85 dB.

17. During the CAL2, while the 2075 takes 20 MHz steps across the frequency band, verify that the noise figure displayed in Window C is less than 13.0 dB from 10 MHz to 1850 MHz.

18. During the CAL3, while the unit takes frequency steps across the band, verify that the noise figure displayed in Window C is less than 28.0 dB from 10 MHz to 1850 MHz.

19. After the 2075 has completed the CAL3, it will return to the start frequency and display values for corrected noise figure and gain. Since nothing has been inserted between the calibrated noise source and the RF INPUT, these values should be 0, with slight random variations.

This concludes the Second Stage Calibration Procedure.

5-9. FINAL DETECTOR LINEARITY TEST

This procedure measures the linearity of the final detector by adding different levels of IF attenuation. For each level, the 2075 measures its own noise figure and the output voltage of the final detector.

A calibrated noise source is required for this test.

The 2075 must be warmed-up for at least 10 minutes before performing this test.

1. Place the POWER switch in the ON position.

2. Connect the calibrated noise source to the RF INPUT.

3. Tune the 2075 to 30 MHz by pressing:

   30 ENTER

   Window A will display 30 MHz.

4. Press the **F** key. This puts the 2075 into the uncorrected noise figure mode.

5. Press the **RIGHT ARROW** key four or five times to add smoothing and slow the random changes of the noise figure value now displayed in Window C.

6. Record the noise figure value displayed in Window C. This value should be less than 6 dB.

7. Press:

   SPEC FUNC 20.2 ENTER

8. The value now displayed in Window A is the output voltage of the final detector. Verify that this value is less than 4.98 volts. Window B displays a 0 indicating that no attenuation is being applied to the RF stage. Window C displays some value which is the amount of attenuation being applied to the IF stages, usually 5 or 10 dB.

8a. Press the **ON/OFF** key.

The green NOISE DRIVE light will go out.

8b. Verify that the voltage now displayed in Window A is greater than .20 volts.

8c. Note the value of IF attenuation displayed in Window C. Use the following table to determine which special function will be required to enable the next higher value of IF attenuation.

SPECIAL FUNCTION	IF ATTENUATION
38.0	Auto-ranging
38.1	0 dB
38.2	5 dB
38.3	10 dB
38.4	15 dB
38.5	20 dB
39.0	Auto-ranging
39.1	25 dB
39.2	30 dB
39.3	35 dB
39.4	40 dB
39.5	45 dB

8d. If the value displayed in Window C is 5, then enter Special Function 38.3 to enable the 10 dB IF attenuator.

9. Press:

   SPEC FUNC 38.3 ENTER

   This will place 10 dB of IF attenuation in the line. Window C displays a 10.

10. Verify that the detector voltage displayed in Window A is less than 4.98 volts.

11. Press the **ON/OFF** key.

    The green NOISE DRIVE light will go out.

12. Verify that the voltage now displayed in Window A is greater than .20 volts.

13. Press the **F** key.

    This returns the 2075 to the Noise Figure measurement mode. The green NOISE DRIVE light will begin to blink.

14. Record the noise figure value displayed in Window C. This value should be virtually equal to the value recorded in Step 6.

15. Press:

    SP FN 38.4 ENTER

    This places 15 dB of IF attenuation in line. Window C will display 15 dB.

16. Verify that the detector output voltage, displayed in Window A, is less than 4.98 volts.

17. Press the **ON/OFF** key.

    This turns off the noise drive voltage and causes the green light to go out.

18. Verify that the detector output voltage displayed in Window A is greater than .20 volts.

19. Press the **F** key.

    This returns the 2075 to the noise figure measurement mode.

20. Record the noise figure value displayed in Window C.

    This value should be virtually the same as those recorded in Steps 6 and 14.

21. Press:

    SPEC FUNC 38.5 ENTER

    This will place 20 dB of IF attenuation in the line. Window C will display 20 dB .

22. Verify that the detector output voltage displayed in Window A is less than 4.98 volts.

23. Press the **ON/OFF** key.

    This turns off the noise drive voltage.

24. Verify that the detector output voltage displayed in Window A is greater than .20 volts.

25. Press the **F** key.

26. Record the noise figure value displayed in Window C. This value should be virtually equal to the values recorded in Steps 6, 14, and 20.

27. Press:

    SPEC FUNC 38.0 ENTER

    This returns the 2075 to its attenuation auto-ranging mode.

This concludes the Final Detector Linearity Test.

5-10. SCOPE/PLOTTER OUTPUT TEST

This test verifies the proper functioning of the X, Y, and Z outputs which are used to drive an external oscilloscope or plotter.

This procedure requires either a dual channel oscilloscope with an X-Y mode or an X-Y plotter.

1. Locate the BNC connectors marked X, Y, and Z on the rear panel of the 2075. Install test cables between these and the X, Y, and Z inputs of the oscilloscope.

2. Locate the INT (INTENSITY) adjustment on the rear panel on the Eaton 2075. Rotate it fully clockwise.

3. Place the 2075 POWER switch in the ON position. Upon power-up the 2075 will automatically output a test pattern.

4. Adjust the amplitude controls on the oscilloscope so that the test pattern fills the display. It may be necessary to adjust the INT control on the rear of the 2075 to obtain a visible pattern.

NOTE

For this test to work properly, the oscilloscope must reduce its intensity with a positive-going TTL signal applied to its Z input.

5. Adjust the INT potentiometer on the 2075 to dim half the test pattern.

6. The displayed test pattern should look like the one shown in Figure 5-1.

Difference in intensity is obtained by adjusting the 2075 rear panel INTENSITY control.

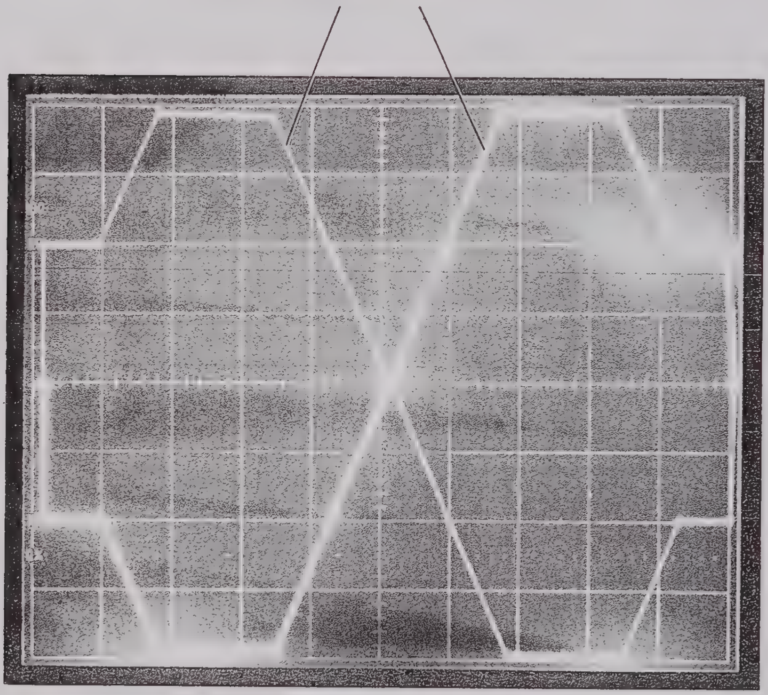


Figure 5-1. OUTPUT TEST PATTERN 2

7. Disconnect the test cable from the Z input of the oscilloscope.

8. Press:

   SPEC FUNC | 7.5 | ENTER

9. A dot will appear in the lower left corner of the oscilloscope display. This is the first alignment point used for aligning an X-Y plotter.

10. Press:

    SPEC FUNC | 7.6 | ENTER

11. A dot will now appear in the upper right corner. This is the second alignment point used for aligning an X-Y plotter.

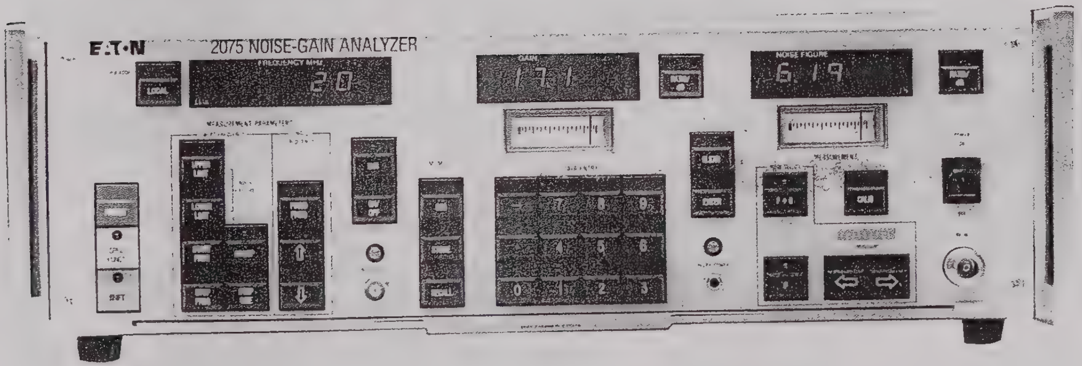
This concludes the oscilloscope/plotter output test.

This concludes the performance verification tests.

MAINTENANCE MANUAL

Manual No. 1-500783-386

EATON 2075
NOISE-GAIN ANALYZER


EATON
2075 NOISE-GAIN ANALYZER
FREQUENCY MHz
GAIN
NOISE FIGURE
LOCAL
SHIFT

EATON

Eaton Corporation
Electronic Instrumentation Division
Los Angeles, California 90066

WARRANTY

Eaton Corporation, Electronic Instrumentation Division, (SELLER) warrants each new instrument to be free from defects in material and workmanship, effective after delivery to the original purchaser as follows:

Electrical and Electronic Measuring Instruments ...... 1 Year

Repair or replacement (at our option) without charge (F.O.B. factory) will be effected when our examination satisfactorily indicates that defects are due to workmanship or materials. Electron tubes, semiconductors, batteries, fuses, lamps, thermoelements, and Ratio Tran potentiometers are excluded from warranty coverage. Warranty returns must first be authorized by the factory.

If the instrument or any portion thereof, has been abused, misused, damaged by accident or negligence, or if any serial number or seal has been removed or altered, the warranty is void.

This warranty is in lieu of all other warranties, express or implied INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY, or fitness for a particular purpose. In no event shall the SELLER be liable for INCIDENTAL OR CONSEQUENTIAL damages. The SELLER neither assumes, nor authorizes any person to assume for it, any other liability in connection with sales of instruments manufactured by SELLER.

With respect to repairs, the foregoing warranty shall apply for a period of ninety days to the repaired portion.

REPAIR AND MAINTENANCE

Instruments should be returned only on prior authorization from the Representative or the factory. You will be advised of detailed shipping instructions at that time. Return the instrument to the factory prepaid. Validity of warranty will be determined by the factory.

Chargeable repairs: If requested, an estimate of charges will be made prior to repairs. Please provide us with the following information in order to expedite the processing of your instrument:

1. Model or Type
2. Serial Number
3. Description of trouble (1)
4. Approximate date instrument was placed in operation.
5. Approximate number of hours in use.
6. Maintenance action previously requested or performed
7. Other comments.

---

(1) Include data on symptoms, measurements taken suspected location of trouble, maintenance action taken and any other relevant data

SERVICE

Additional service information can be made available by calling any of these Eaton Sales and Service Centers:

Elmhurst, IL — (312) 279-8220
Los Angeles, CA — (213) 822-3061
Oakton, VA — (703) 620-5820
Sunnyvale, CA — (408) 733-6574

FRANCE • Argenteuil • Telephone: (01) 39-81-74-46 • Telex: 609036
UNITED KINGDOM • Wokingham • Telephone: (0734) 794717 • Telex: 847238
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SECTION 1

GENERAL INFORMATION

1-1. SCOPE AND ORGANIZATION OF THE MANUAL

This manual contains information and procedures required for maintenance of the Eaton 2075-2A Noise-Gain Analyzer. Information required for operation of the 2075-2A is contained in a separate Operation Manual, manual number 500783-385.

This manual is divided into seven sections as follows:

Section 1: General Information

Section 2: Performance Verification Tests

Section 3: Alignment and Adjustment

Section 4: Theory of Operation

Section 5: Troubleshooting

Section 6: Replaceable Parts List

Section 7: Drawings

NOTE

> Eaton 2075 is the generic model designation for the Noise-Gain Analyzer. It was first released as the Eaton 2075-2; the most recent version is the Eaton 2075-2A. Both versions are identical in form, fit and function except that in the Eaton 2075-2A the basic input frequency range has been extended. The Eaton 2075-2 has an input frequency range of 10 MHz to 1800 MHz. The basic input frequency range of the Eaton 2075-2A is 10 MHz to 1850 MHz, per its specifications. However the unit is tunable to, and can actually be operated at, up to 1900 MHz. The actual model number is located on the identification label on the rear panel.

The instrument is hereinafter referred to as the Eaton 2075.

1-2. INTRODUCTION

This section of the manual contains a general description of the Eaton 2075 Noise-Gain Analyzer including: purpose and function, equipment requirements, specifications, controls and indicators, special functions, error messages, and safety precautions.

1-3. PURPOSE AND USE OF EQUIPMENT

The 2075 Noise-Gain Analyzer is a programmable, microprocessor-controlled, double conversion receiver designed specifically to make precise measurements of noise and gain characteristics of RF devices. The analyzer can be controlled in its local mode using its front panel controls, or in its remote mode, by an external controller via an IEEE-488 GPIB (General Purpose Interface Bus).

The analyzer can make the following measurements:

Corrected Noise Figure and Gain	(F+G)*
Uncorrected Noise Figure	(F)*
Corrected Effective Input Noise Temperature and Gain	(T_e+G)
Effective Input Noise Temperature	(T_e)
Corrected Effective Operating Noise Temperature and Gain	(T_{op}+G)
Effective Operating Noise Temperature	(T_{op})
Noise Measure (includes Gain)	(M)*
Y Factor	(Y)*
Power	(PWR dB)*
Excess Noise Ratio	(ENR)*

*Can be displayed in dB or as a dimensionless ratio

The specified input frequency range of the 2075 extends from 10 MHz to 1850 MHz. However, the unit is actually tunable and operable to 1900 MHz. In its simplest test configuration the analyzer will make measurements of RF devices with output frequencies in this range. More complex test configurations, requiring one or two stages of external downconversion, allow measurements of devices with output frequencies as high as 65.535 GHz. The 2075 has the capability for controlling the local oscillator used in the external downconversion process.

1-4. CALIBRATION CYCLE

At six month intervals the Performance Verification Procedures in Section 2 of this manual should be performed to verify optimum performance of the 2075.

At one year intervals the instrument should be fully calibrated using the procedures in Section 3 of this manual. These procedures should be performed by qualified personnel experienced in calibration and servicing of electronic instrumentation.

1-5. EQUIPMENT SUPPLIED

The items listed in Table 1-1 are furnished with the 2075 Noise-Gain Analyzer.

Table 1-1. Equipment Supplied

QTY.	DESCRIPTION	PART NO.
1	AC Power Cord, 2 meters	1-910166-001
1	External Relay Plug	1-910417-101
1	Fuse, 1.0 Amp, slow-blow (for 220V operation)	1-924000-019
1	Operation Manual	500783-385
1	Maintenance Manual	500783-386

1-6. EQUIPMENT REQUIRED BUT NOT SUPPLIED

A calibrated noise source is required when performing the Performance Verification Tests of Section 2 and the Alignment and Adjustment procedures of Section 3. The noise source used should cover the frequency range from 10 MHz to 1850 MHz. Recommended noise sources which cover this range are listed in Table 1-2.

A maintenance kit consisting of extender boards and cables is available. The kit is not required for calibration of the 2075, however it is required for troubleshooting. An anti-static workstation is also available for use during troubleshooting.

Table 1-2. Equipment Required But Not Supplied

ITEM NO.	DESCRIPTION	MODEL NO.
1	Solid State Noise Source 10 MHz-1500 MHz	7615
2	Solid State Noise Source 1 GHz-12.4 GHz	7616
3	Solid State Noise Source 10 MHz-18 GHz	7618E
4	Solid State Noise Source 10 MHz-26.5 GHz	7626
5	Maintenance Kit for Eaton 2075 (Extender Boards and Cables)	1-006586-001
6	Anti-Static Workstation	1-998484-001

1-7. TEST EQUIPMENT REQUIRED

Table 1-3 lists all test equipment required for the Performance Verification Tests of Section 2 and the Calibration Procedures of Section 3. An abbreviated list is also given in each of those sections showing the equipment required just for the procedures in that section.

Table 1-3. Test Equipment Required

ITEM	CRITICAL PARAMETERS	RECOMMENDED MODEL
Calibrated Noise Source	10-1850 MHz min. 15-16 dB ENR	Eaton 7618E
Digital Voltmeter	5 1/2 Digits min.	Fluke 8840A
Frequency Counter	10-4000 MHz	HP 5340A
Comb Generator	10 MHz and 100 MHz combs	HP 8406A
Calibrated Precision Voltage Source	0-5 V, .1 mV resolution	Datel Intersil DVC-8500A
Signal Generator	30 MHz CW	HP 8656A
Power Meter	30 MHz	HP 436A
Power Detector	−29 to −40 dBm range	HP 8484A
Power Splitter	6 dB	HP 11652-6009
10 dB Step Attenuator	accurate up to 2.0 GHz	HP 8495A
1 dB Step Attenuator	accurate up to 2.0 GHz	HP 8494A
30 dB Fixed Attenuator	Type N connectors	HP 8491 option 030
(3) 3 dB Fixed Attenuators	2 GHz	Midwest Microwave 238-3 dB
Amplifier	approximately 30 dB gain from 700-4000 MHz	Mini Circuits ZHL-42
(2) Amplifiers	approximately 20 dB gain from 10-2000 MHz	Mini Circuits ZFL-2000

1-8. SPECIFICATIONS

Specifications for the 2075 are listed in Tables 1-4 and 1-5. Table 1-4 lists the basic specifications. Supplemental information consisting of non-warranted, nominal performance characteristics is listed in Table 1-5.

Table 1-4. Eaton 2075 Performance Specifications

PERFORMANCE CHARACTERISTIC	LIMIT	CONDITIONS
NOISE FIGURE MEASUREMENT:		
Range	0 to 30 dB	
Resolution	0.01 dB	
Uncertainty	±0.05 dB	1) Noise Figure 0 to 12 dB 2) Temperature +10 to +40 °C 3) ENR of 5 to 18 dB
	±0.10 dB	1) Noise Figure >12 dB 2) Temperature <10 °C or >40 °C
GAIN MEASUREMENT:		
Range	−20 dB to +50 dB	
Resolution	0.01 dB	
Uncertainty	±0.2 dB	
INPUT:		
Frequency Range	Specified parameters apply from 10 MHz to 1850 MHz. Unit is tunable and operable up to 1900 MHz	
Frequency Resolution	1 MHz (test configurations 1 - 6) 0.1 MHz (test configuration 1 only)	
Tuning Accuracy	±(0.5 MHz+0.005 times the tuned frequency) ±3 MHz maximum	
Second Stage Noise Figure	7 dB +.001 dB/MHz	For input power levels below −40 dBm
Input SWR	<1.5:1	
Reflection Coefficient	<0.2	
Allowable Net External Gain	>75 dB	

Table 1-4. Eaton 2075 Performance Specifications (Continued)

PERFORMANCE CHARACTERISTIC	LIMIT	CONDITIONS
ELECTROMAGNETIC COMPATIBILITY:		
Conducted and Radiated Emissions	MIL STD 461A, CISPR Publication 11, and Messempfaenger-Postverfuegung 526/527/79	Conducted and radiated interference complies with MIL STD 461A, Methods CE03 and RE02, CISPR Publication 11 (1975), and Messempfaenger Postverfuegung 526/527/79 (Kennzeichnung Mit F-Nummer/Funkschutzzeichen)
Conducted and Radiated Susceptibility	MIL STD 461A 1968	Conducted and radiated susceptibility meets the requirements of methods CS01, CS02, CS06, and RS03 (1 Volt/meter) of MIL-STD-461A, 1968
GENERAL:		
Noise Source Drive Voltage	28.0 volts ± .05 V < 1.0 volt	Noise Source ON at up to 100 mA peak Noise Source OFF
Line Voltage	100 VAC ± 10%	48 to 66 Hz
	110 VAC ± 10%	48 to 66 Hz
	220 VAC ± 10%	48 to 66 Hz
	240 VAC ± 10%	48 to 66 Hz
Power Dissipation	200 VA maximum	
Operating Temperature	0 to 55 ° C	
Storage Temperature	−55 to +75 ° C	
Height	146 mm (5.75 in.)	5¼ in. vertical rack space
Width	425 mm (16.8 in.)	
Depth	354 mm (14.0 in.)	
Weight	11.5 kg (25.5 lbs.)	

Table 1-5. Eaton 2075 Supplemental Specifications

CHARACTERISTIC	NOMINAL OR TYPICAL VALUE
Bandwidth	5.0 MHz Noise Bandwidth
Maximum Safe Input Level	+20 dBm RF or ±20 VDC
External Relays Drive Voltages and Currents	+5 VDC, 5 VA maximum +15 VDC, 4.5 VA maximum +30 VDC, 15 VA maximum
Controller Functions	HP 8672A, HP 8350A, Wiltron 6600 Series Sweep Generators, General Format
ENR Tables Storage Capacity	3 tables, each can store up to 31 frequencies with corresponding ENR values, plus 1 PROM table can store 1 ENR value for all frequencies (4 tables total). An additional, optional PROM table can be ordered with the noise source.

Table 1-5. Eaton 2075 Supplemental Specifications (Continued)

CHARACTERISTIC	NOMINAL OR TYPICAL VALUE
Frequency Display	Displays Frequency in MHz, 4 GPIB annunciators are: SRQ Service Request RMT Remote TALK Talk LISTEN Listen 4 Parameter Annunciators are: LO Local Oscillator RF Radio Frequency IF Intermediate Frequency ENTER Enter Frequency Prompt
Gain Display	Displays Gain and other values. The 8 Annunciators are: LOSS Gain is less than zero dB ENR Excess Noise Ratio T (F) Temperature in Fahrenheit T (C) Temperature in Centigrade T (K) Temperature in kelvin ENTER Enter Value Prompt dB Units are displayed in dB RATIO Units are displayed as Ratio
Noise Figure Display	Displays Noise Figure and other values. The 8 Annunciators are: F Noise Figure Y Y-Factor T_e(K) Effective Input Noise Temperature in kelvin dB PWR Power and ENR M Noise Measure T_{op}(k) Operating Noise Temperature dB Units displayed are in dB RATIO Units displayed as Ratio
Analog Gain Meter	Analog Indicator for Gain. Variable range is set by entering upper and lower limits.
Analog Noise Meter	Analog Indicator for Noise Figure. Variable range is set by entering upper and lower limits.
Scope/Plotter Output Connectors X, Y, Z	Rear panel connectors supply drive signals for external oscilloscope or X-Y plotter. Variable range is set by entering upper and lower limits. Output voltage range is 0 to 6 volts for X and Y. Z axis output is positive going TTL, 0 to 5 volts signal for blanking the oscilloscope.
IF Output	−25 dBm to −55 dBm, 5 MHz Bandwidth
DET Output	.2 volts to approx. +5 volts, high impedance output

Table 1-6. Front Panel Controls and Indicators

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
1.	PRESET	Returns front panel control settings to preset values and stores current front panel control settings in memory register 0. Press: PRESET
2.	SPEC FUNC	Allows the entry of special function codes. To place the 2075 into any special function mode press: SPEC FUNC *numeric code* ENTER
		Allows viewing of the special function table to see which special functions are set to their default (.0) values or to some active state (.1, .2, .3, etc.). To enter the viewing mode, press: SPEC FUNC and use the **UP ARROW** and **DOWN ARROW** keys to move through the table.
		When already in this viewing mode, to change or enter a special function, enter the desired special function code by pressing: *numeric keys* ENTER This will also cause an exit from the viewing mode.
		To exit the special function table viewing mode without changing any settings, press: SPEC FUNC
3.	SHIFT	Initiates the shift function (secondary function) of the next key pressed. Press: SHIFT function key If the **SHIFT** key is pressed accidently, it can be deactivated by pressing it again.

Table 1-6. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
4.	LOCAL	Switches the 2075 from REMOTE to LOCAL mode except when local lockout is in effect. When in REMOTE press: LOCAL
		Allows the GPIB address of the 2075 to be displayed or a new address to be entered when in the LOCAL mode. When in the LOCAL mode press: LOCAL *numeric keys* ENTER
		Allows the GPIB address of an external local oscillator to be displayed or a new address to be entered. When in LOCAL mode only, press: SHIFT LOCAL *numeric keys* ENTER
5.	**FREQUENCY DISPLAY**	This LED display is also referred to as Window A. It displays the frequency, in MHz, of the function being performed. This display also has 8 annunciators. The 4 annunciators on the left refer to GPIB states. These are SRQ (service request), RMT (remote), TALK, and LISTEN. The four annunciators on the right are LO (local oscillator), IF (intermediate frequency), RF, and ENTER. A blinking ENTER annunciator signals the operator to enter a frequency value into an ENR table.
6.	ENR	Initiates the entry mode for ENR versus frequency values in the ENR versus frequency tables. Press this key once to initiate the entry mode. Press it again after all the entries have been made, to exit this mode. The lamp in the center of this key is lit while in the entry mode. Allows entry of the value for T_{hot} in kelvins. Press: SHIFT ENR
7.	ON/OFF	When operating in the manual measurement mode (normally used only with a true hot/cold thermal noise source), triggers a measurement. Press: ON/OFF
		Allows entry of the value for T_{cold}, in kelvins. Press: SHIFT ON/OFF *numeric keys* ENTER

Table 1-6. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
7.	ON/OFF (continued)	When Special Function 20.1 is in use, this key is used to display the ON voltage output from the Final Detector. If Special Function 20.2 is in use, pressing this key will display the OFF voltage output from the final detector. In either case, press: ON/OFF
8.	**NOISE DRIVE ON INDICATOR**	When operating in the manual measurement mode (normally used only with a true hot/cold thermal noise source), this lamp lights to tell the operator what measurement phase is being taken or has just been completed. **ON = hot, OFF = cold.** This indicator is not functional in the automatic measurement mode unless enabled by Special Function 21.1.
9.	**NOISE DRIVE CONNECTOR**	Supplies +28.00 volts DC drive voltage for a solid state calibrated noise source.
10.	**GAIN DISPLAY**	This display is also referred to as Window B. It displays Gain (G) or loss, ENR values, and temperature values entered by the user. Gain, loss, and ENR values may be displayed in dB or as ratios. Temperatures may be displayed as kelvins, degrees Centigrade, or degrees Fahrenheit. The eight annunciators in this display are LOSS, ENR, T(degrees F), T(degrees C), dB, RATIO, T(K), and ENTER. The ENTER annunciator blinks when the user is required to enter an ENR value.
11.	**ANALOG GAIN METER**	Is an analog indicator for Gain. The meter range is set by entering upper and lower meter limits for Gain. See items 35 and 36 of this table.
12.	RATIO/ dB	Changes the Window B unit of display for Gain or ENR from dB to a ratio or vice versa. An annunciator in the display shows which display unit is selected. Press: RATIO/ dB
13.	**NOISE FIGURE DISPLAY**	This display is also referred to as Window C. It displays Noise Figure, Y Factor, Effective Input Noise Temperature, Power Noise Measure, and Operating Noise Temperature. Noise Figure, Noise Measure, Y-Factor, and Power may be displayed as dB or as a ratio, depending on the unit of display selected. The eight annunciators in this display are F, Y, T_e(K), dB PWR, dB, RATIO, M, and T_{op}(K).

Table 1-6. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
14.	**ANALOG NOISE METER**	Is an analog indicator for noise figure. The meter range is set by entering upper and lower limits for the measurement desired. See items 35 and 36 of this table.
15.	RATIO/ dB	Changes the Window C unit of display from dB to a ratio or vice versa. An annunciator in the display indicates which is selected. Press: RATIO/ dB
16.	CALIB	Initiates an FCAL (frequency calibration) if Special Function 15.0 is enabled, and then a second stage calibration of the 2075. During second stage calibration the 2075 measures its own noise figures at different frequencies and stores these values for later use during corrected noise figure and gain measurements. Press: CALIB
		This key also is used to abort a calibration in progress. Press: CALIB
		Initiates a second stage calibration at the single fixed frequency to which the 2075 is currently tuned. Press: SHIFT CALIB
17.	**POWER ON/ OFF SWITCH**	Applies line voltage to the 2075 when the switch is set to ON.
18.	**SMOOTHING INDICATOR**	Shows the degree of smoothing currently in use. Each lit LED bar indicates a power of 2 increase in the smoothing factor. Smoothing factor is equal to the number of readings taken and averaged before the measurement is displayed when in the swept mode. Exponential smoothing is used during single frequency measurements.
19.	⇨	Adds smoothing in increments equal to powers of 2. Press or hold: ⇨

Table 1-6. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
20.	⇦	Subtracts smoothing in decrements equal to powers of 2. Press or hold: ⇦
21.	**RF INPUT CONNECTOR**	Is the 2075 input connector.
22.	F+G	Initiates measurement of corrected Noise Figure and Gain. Press: F+G *
		Initiates measurement of corrected T_e (Effective Noise Temperature) and Gain. Press: SHIFT F+G *
		*Requires prior Second Stage Calibration
23.	F	Initiates measurement of uncorrected Noise Figure. Press: F
		Initiates measurement of uncorrected T_e (Effective Noise Temperature) in kelvins. Press: SHIFT F
24.	**RELAY POWER ON INDICATOR**	This green lamp lights to indicate that the selected relay power voltage is present at the RELAY POWER OUTPUT CONNECTOR. This voltage is automatically turned on when the **CALIB** key is pressed.
25.	**RELAY POWER CONNECTOR**	This output connector provides a jumper selectable DC voltage of +5, +15, or +30 volts which may be used to actuate external relays. The external relays are used to bypass the DUT (Device Under Test) during Second Stage Calibration.

Table 1-6. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
26.	**DATA ENTRY KEYPAD 0-9, -, .**	Used to enter numeric data for various instrument functions. Digits keyed-in are displayed but do not become effective until the **ENTER** key is pressed. Press: *numeric data keys* ENTER
27.	CLEAR	Clears all numeric data which has been keyed-in but not yet terminated with the **ENTER** key. After the unwanted or erroneous numerics have been keyed-in, press: CLEAR
		When in the ENR versus Frequency entry mode, clears the Frequency/ENR pair currently displayed. Press: CLEAR
		When in the ENR versus Frequency entry mode, clears the table in use. Press: SHIFT CLEAR
28.	ENTER	Completes all numeric data entries. Numeric data which has been keyed-in does not take effect until this key has been pressed. Press: *numeric keys* ENTER
		When entering frequency and ENR values this key can be used to toggle the blinking ENTER annunciator back and forth between Window A and Window B. The ENTER annunciator indicates which value must be entered next, frequency or ENR. Press: ENTER
29.	SEQ	Causes sequential stepping through nine (1-9) of the ten front panel storage registers. The number of each register is displayed as it becomes available for access. These registers store front panel control settings for later recall and reuse. See paragraph 3-47. Press: SEQ ENTER

Table 1-6. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
29.	SEQ (continued)	Allows reprogramming of the stepping sequence through the 9 front panel storage registers. Key-in the entire new sequence before pressing the **ENTER** key. Press: SHIFT SEQ *numeric keys* ENTER
30.	STORE	Causes the current front panel control settings to be stored in 1 of the 9 front panel storage registers. Press: STORE *numeric key* ENTER
31.	RECALL	Causes a set of previously stored front panel control settings to be recalled from any of the 10 storage registers and made active. Press: RECALL *numeric key* ENTER
		Continues a sweep which was stopped in progress, from the point at which it was stopped. See item 39 of this table. Press: SHIFT RECALL
32.	FIXED FREQ	Allows entry of a fixed frequency to be used for a single frequency measurement. Press: FIXED FREQ *numeric keys* ENTER
		Allows entry of the frequency step size for manual frequency incrementing only. (If the frequency step size for automatic continuous sweeps or single sweeps is changed, using item 40 of this table, the manual frequency incrementing step size will automatically change to that same value.) SHIFT FIXED FREQ *numeric keys* ENTER
33.	⇧	Causes frequency to step upward when in the fixed frequency mode. Also causes frequency to increment when viewing Frequency versus ENR tables. Press or hold: ⇧

Table 1-6. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
33.	⇧ (continued)	Causes incrementing through the special functions table when in the special functions viewing mode. See item 2 of this table. Press or hold: ⇧
		Allows entry of a signal amplitude (in dBm only) for an external local oscillator. Press: SHIFT ⇧ *numeric keys* ENTER
34.	⇩	Causes frequency to step downward when in the fixed frequency mode. Also causes frequency to decrement when viewing the Frequency versus ENR tables. Press or hold: ⇩
		Causes decrementing through the special functions table when in the special functions viewing mode. Press or hold: ⇩
		Allows entry of the Second Local Oscillator frequency used in DUT (Device Under Test) Configuration 6. Press: SHIFT ⇩ *numeric keys* ENTER
35.	UPPER LIMIT	Allows entry of the upper limit for Window C measurements. The minimum upper limit allowed is −30 and the maximum upper limit allowed is 9999. The value entered is used by the 2075 only to set the range of the ANALOG NOISE METER and to set the range for the SCOPE/PLOTTER OUTPUT. Press: UPPER LIMIT *numeric keys* ENTER

Table 1-6. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
35.	UPPER LIMIT (continued)	Allows entry of the upper limit for Gain. The maximum allowable upper limit is 80 dB and the minimum allowable upper limit is −30 dB. This value is used by the 2075 to set the ranges for the ANALOG GAIN METER and the SCOPE/PLOTTER OUTPUT. Press: SHIFT UPPER LIMIT *numeric keys* ENTER
36.	LOWER LIMIT	Allows entry of the lower limit for measurements displayed in Window C. The minimum allowable lower limit is −30. The maximum allowable lower limit is 9999. The value entered is used by the 2075 only to set the range of the ANALOG NOISE METER and to set the range for the SCOPE/PLOTTER OUTPUT. Press: LOWER LIMIT *numeric keys* ENTER
		Allows entry of the lower limit for Gain. The minimum allowable lower limit is −30 dB. The maximum allowable lower limit is 80 dB. The value entered is used by the 2075 only to set the ranges for the ANALOG GAIN METER and the SCOPE/PLOTTER OUTPUT. Press: SHIFT LOWER LIMIT *numeric keys* ENTER
37.	START FREQ	Allows entry of the start frequency for frequency sweeps. Press: START *numeric keys* ENTER
		Causes the 2075 to tune to the current start frequency value. The previous value for fixed frequency is lost and replaced with this current start frequency value. Press: START FREQ
		Allows entry of the IF frequency from the external mixer when external downconversion is required in test configurations 2, 4, and 6. The IF frequency is the input frequency to the 2075. Press: SHIFT START FREQ *numeric keys* ENTER

Table 1-6. Front Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTIONS AND KEYSTROKE SEQUENCES
38.	STOP FREQ	Allows entry of the stop frequency for frequency sweeps. Press: STOP FREQ *numeric keys* ENTER
		Causes the 2075 to tune to the current value for stop frequency. The previous value for fixed frequency is lost and replaced with this current stop frequency value. Press: STOP FREQ
		Allows entry of a fixed Local Oscillator frequency when external downconversion is required (DUT Test Configurations 2-6). Press: SHIFT STOP FREQ *numeric keys* ENTER
39.	SWEEP	Initiates continuous automatic sweeps from start frequency to stop frequency. Each sweep is composed of incremental frequency steps across the band. Press: SWEEP
		Stops a sweep in progress and leaves the 2075 tuned to the frequency at which the sweep was stopped. See item 31 in this table. Press: SWEEP
		Initiates a single sweep from the start frequency to the stop frequency. Press: SHIFT SWEEP
40.	STEP SIZE	Allows entry of the incremental frequency step size for automatic continuous or single sweeps (.1 MHz minimum). Entering this value will also change the step size for manual frequency incrementing or decrementing. Press: STEP SIZE *numeric keys* ENTER

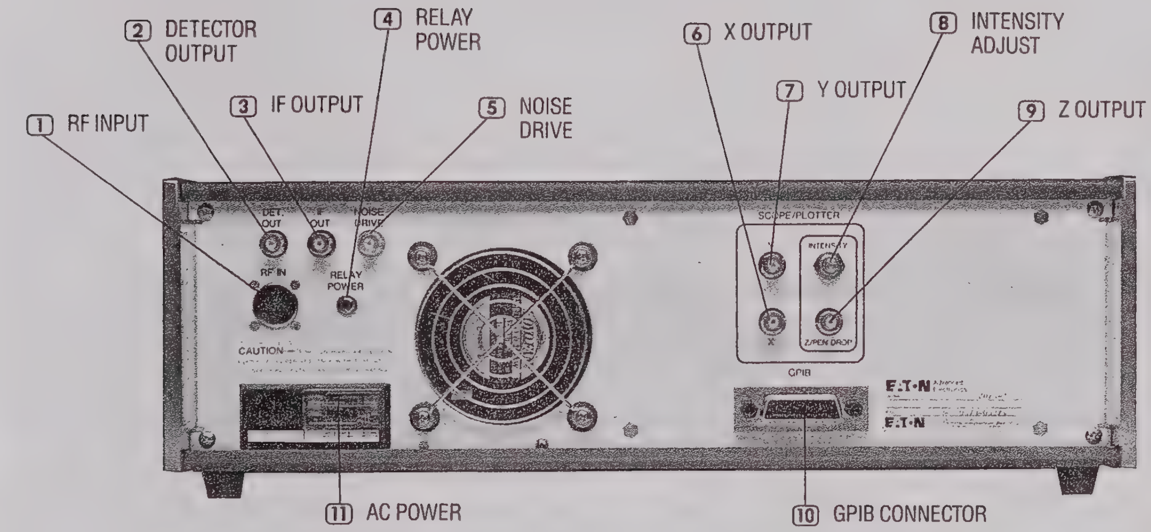

1 RF INPUT
2 DETECTOR OUTPUT
3 IF OUTPUT
4 RELAY POWER
5 NOISE DRIVE
6 X OUTPUT
7 Y OUTPUT
8 INTENSITY ADJUST
9 Z OUTPUT
10 GPIB CONNECTOR
11 AC POWER
DET. OUT
IF OUT
NOISE DRIVE
RF IN
RELAY POWER
CAUTION
SCOPE/PLOTTER
INTENSITY
X
Z/PEN DROP
GPIB
EATON
EATON

Figure 1-2. REAR PANEL CONTROLS AND INDICATORS

Table 1-7. Rear Panel Controls and Indicators

ITEM	DESIGNATION	FUNCTION
1.	**RF INPUT CONNECTOR**	This RF INPUT connector on the rear panel is optional when ordering the 2075. It is also possible to remove the front panel RF INPUT connector and install it on the rear panel. The internal semi-rigid coaxial cable can be reshaped to make the necessary connection.
2.	**DET OUT**	This BNC connector is the test output for the Final Detector output voltage.
3.	**IF OUT**	This BNC connector is the test output for the 30 MHz signal which is the result of the second stage of internal downconversion in the 2075.

Table 1-7. Rear Panel Controls and Indicators (Continued)

ITEM	DESIGNATION	FUNCTION
4.	**RELAY POWER CONNECTOR**	This output connector provides a jumper selectable DC voltage of +5, +15, or +30 volts which may be used to actuate external relays. The external relays are used to bypass the DUT during Second Stage Calibration. This connector parallels the RELAY POWER connector on the front panel.
5.	**NOISE DRIVE CONNECTOR**	Supplies +28.00 volts DC for the solid state calibrated noise source. Parallels the NOISE DRIVE connector on the front panel.
6.	**X OUTPUT**	This BNC connector is the output for the horizontal drive signal to the scope/plotter X axis. The X axis drive for both gain and noise figure traces are output alternately. The saw tooth waveform minimum and maximum voltages are 0 and 6 volts respectively.
7.	**Y OUTPUT**	This BNC connector is the output for the scope/plotter Y axis. The Y axis drives for both gain and noise data are output singly or alternately depending on the setting of special function 7. The minimum and maximum voltages are 0 and 6 volts respectively.
8.	**INTENSITY ADJUST**	This adjustment controls the brightness of the gain and noise figure traces on the oscilloscope.
9.	**Z OUTPUT**	This BNC connector is the output for the scope/plotter Z axis. This positive going signal blanks the oscilloscope during retrace or activates the pen lift on the plotter. It also decreases the intensity for the gain trace. When both gain and noise figure are being displayed on an oscilloscope, the noise trace is the brighter one. The signal minimum and maximum voltages are 0 and 5 volts.
10.	**GPIB**	This 24 pin connector is the input/output connector for the General Purpose Interface Bus (IEEE-488).
11.	**AC POWER**	This is the receptacle for the AC power cord, the holder for the AC fuse, and the receptacle for the AC voltage selector card.

1-10. SPECIAL FUNCTIONS

Special Functions extend the range of the instrument's available functions beyond those normally selectable by dedicated front panel keys. Special Functions are selected by entering numeric special function codes using the front panel numeric keypad.

For example, to select Special Function 2.1 press:

SPEC FUNC 2.1 ENTER

This will set Special Function 2 to 2.1 regardless of its previous state.

For each special function code, the integer value to the left of the decimal selects the special function itself, and the number to the right of the decimal selects the state to which that special function will be set.

Each special function has a basic state which is denoted by a 0 to the right of the decimal. For example, the basic states for Special Functions 2 and 3 are 2.0 and 3.0. The only exceptions to this rule are Special Functions 1 and 16 which have no .0 states. For these two, the basic states are denoted by 1.1 and 16.1 respectively.

The non-basic states are indicated by a number other than 0 to the right of the decimal. For example, 2.1 and 2.2 are non-basic states for Special Function 2.

When the 2075 is powered-on, some special functions assume the basic state and some assume the last state they were in before the instrument was powered-off. For a listing of power-on states see Table 1-9. However, after a PRESET or a Total System Reset is performed, most special functions assume their basic states.

Some special functions can be stored along with front panel control parameters in the Front Panel Storage Registers. These storable special functions are indicated in Table 1-8.

The current state for each special function is stored in a Special Functions Table in the 2075. To call up this table for examination, press:

SPEC FUNC

Then use the **UP ARROW** and **DOWN ARROW** keys to move up and down through the table to view the current state of each special function. To exit the Table Viewing Mode press the **SPEC FUNC** key again or complete the keystroke sequence for making a special function entry, **NUMERIC KEYS** and then **ENTER**. Note that only one special function may be changed or entered while in the viewing mode, and this causes an exit from the mode.

The easiest way to edit the table is to enter the viewing mode and note any changes which are desired. Then simply enter the new special functions.

Table 1-8 lists all special functions, their numeric codes, and the corresponding GPIB codes. The table also shows which special functions revert to their basic states upon power-on and which ones assume their previous states. Special functions which are storable in the Front Panel Storage Registers are also indicated.

For any 2075 with Software Update (SU6), all special function codes can be sent to the 2075 over the GPIB. The GPIB code for special function is SP. The GPIB code and format to send any special function over the bus is:

SP XX.X ET

Insert the appropriate numeric code for the special function in place of the X's. For example, to set Special Function 14.1 over the bus the code would be SP 14.1 ET. The ET is the terminator (GPIB code for ENTER).

Some special functions also have an alphanumeric code (device message code) which can be sent over the GPIB. These special functions can be sent by using the format above, or by sending the alphanumeric character code. For example, Special Function 15.1 can be sent over the GPIB as:

SP 15.1 ET

Or it can be sent as:

FC CR LF

FC is the alphanumeric code, or device message code, for Special Function 15.1. The CR LF is a carriage return, line feed, and is the general line terminator when sending device messages to the 2075.

Table 1-8. Special Functions Table

Function Type	SF Code	Power Up	S/ R	GPIB Code	Function Description
Total System Reset	0.0	0.0	N	N/A	Normal measurement
	0.9				Erase BBU RAM data
Select Test Configuration	1.1	1.1	Y	D1	DUT Configuration 1 (Standard default)
	1.2			D2	DUT Configuration 2 (fixed IF; varbl LO)
	1.3			D3	DUT Configuration 3 (varbl IF; fixed LO)
	1.4			D4	DUT Configuration 4 (fixed IF; varbl LO)
	1.5			D5	DUT Configuration 5 (varbl IF; fixed LO)
	1.6			D6	DUT Configuration 6 (2 LO's; fixed & varbl)
Sideband Selection	2.0	2.0	Y	A0	Double Sideband (no offset)
	2.1			A1	Lower Single Sideband
	2.2			A2	Upper Single Sideband
Settle Time or Delay Time	3.0	3.0	N	N/A	Normal Measurement
	3.1			ST	Display/Enter Ext LO settling time or time delay to ignite gas discharge NS
Bandwidth Compensation	4.0	4.0	N	N0	Disable bandwidth compensation
	4.1			N1	Display/Enter DUT bandwidth & go to 4.0
	4.2			N2	Display/Enter 2nd stage BW & go to 4.0
	4.3			N3	Enable bandwidth compensation
ENR Table Selection	5.0	PREV	Y	B0	Use nominal value of ENR
	5.1			B1	Use ENR Table 1 (user must enter)
	5.2			B2	Use ENR Table 2 (user must enter)
	5.3			B3	Use ENR Table 3 (user must enter)
	5.4			B4	Use ROM ENR Table. (Special ROM required)
Measurement Mode	6.0	6.0	N	N/A	Normal Measurement
	6.1			N/A	Manual Noise Figure Measurement
X/Y Output Configurations	7.0	7.2	N	NP	Display NF and Gain vs Frequency on scope
	7.1			P1	Display test pattern #1 on scope
	7.2			P2	Display test pattern #2 on scope
	7.3	or		NQ	Display NF only vs frequency on scope
	7.4			AQ	Display Gain only vs frequency on scope
	7.5	7.5		LL	Move plotter pen to lower left
	7.6			UR	Move plotter pen to upper right
	7.7			FQ	Plot NF vs frequency on plotter*
	7.8			GQ	Plot Gain vs frequency on plotter*
	7.9			FG	Plot on strip chart, X-out=NF/Y-out=G
Display Revision	8.0	8.0	N	N/A	Normal Measurement
	8.1			N/A	Display software update number
Frequency Resolution	9.0	PREV	N	RF	Normal 1 MHz frequency resolution
	9.1			RN	100 kHz frequency resolution

*Activated by a single sweep

Table 1-8. Special Functions Table (Continued)

Function Type	SF Code	Power Up	S/R	GPIB Code	Function Description
S/R=Store/Recall Capability—can be stored in front panel storage registers. Y=yes, N=no PREV=Previous value used before power down					
Drive for External Relays	10.0				External relay drive voltage ON only during Second Stage Calibration.
	10.1				Relay drive voltage continuously ON
Measurement Selection	11.0	11.0	N	NF	Cascade NF measurement (normal mode)
	11.1			YF	Y-Factor measurement
	11.2			OP	Operating Noise Temperature (K) measurement
	11.3			PM	Power measurement (NS off)
	11.4			PN	Power measurement (NS on)
	11.5			NE	"Noise measure" measurement
	11.6			PE	ENR Measurement
Temperature Units Selection for T_{hot}, T_{cold}	12.0	PREV	N	SK	Temperature units in kelvins
	12.1			SC	Temperature units in Centigrade
	12.2			SF	Temperature units in Fahrenheit
Display ENR In Use	13.0	13.0	N	CO	Normal measurement
	13.1			CE	Display ENR in use at the fixed frequency
Hold and Trigger Measurement	14.0	14.0	N	T0	Normal continuous measurement
	14.1			T1	Hold measurement cycle
	14.2			T2	Execute one measurement cycle and hold
Frequency Calibration Interval Selection	15.0	15.0	N	AF	Normal automatic frequency calibration
	15.1			FC	Do an FCAL and return to 15.0
	15.2			DF	Disable automatic frequency calibration function
Second Stage Calibration Input Gain Selection	16.1	16.1	N	C1	Use calibration setting #1 (0, 15, 30 dB)
	16.2			C2	Use calibration setting #2 (15, 30, 40 dB)
	16.3			C3	Use calibration setting #3 (30, 40, 55 dB)
Loss Compensation Selection	17.0	17.0	N	NS	No loss compensation
	17.1			LC	Use loss compensation (use with SF 18)
Display and Enter Loss Data	18.0	18.0	N	L0	Normal measurement
	18.1			L1	Enter loss before the DUT (dB)
	18.2			L2	Enter temperature of DUT before loss
	18.3			L3	Enter loss after the DUT (dB)
IF Attenuator Calibration	19.0	19.0	N	N/A	Normal measurement
	19.1			IC	Do IF attenuator calibration and go to 19.0
Voltage/Attenuator Display Mode	20.0	20.0	N	V0	Normal measurement
	20.1			V1	Display E-off voltage in window A; RF attenuator setting in window B; IF attenuator setting in window C;
	20.2			V2	Display E-on voltage in window A; RF attenuator setting in window B; IF attenuator setting in window C; (with auto attenuation)

Table 1-8. Special Functions Table (Continued)

Function Type	SF Code	Power Up	S/R	GPIB Code	Function Description
Noise Drive Indicator Function	21.0	21.0	N	LD	Noise source lamp is off
	21.1			LE	Lamp is ON when NS power is ON and OFF when NS power is OFF
Display Blanking	23.0	23.0	N	DE	Normal measurement
	23.1			DD	Blank all displays during measurement (for GPIB operations only)
Interpolation Selection	24.0	24.0	N	MC	Prohibits NF/G measurements at non-calibrated points
	24.1			MN	Uses interpolation for measurements at non-calibrated points (low accuracy)
Special Functions 30 thru 39 are service functions for use by qualified service personnel only.	30.0	30.0	N	N/A	Return for NF measurement
	30.1			N/A	Hysterisis calibration test
	30.2			N/A	Zero frequency adjust
	30.3			N/A	Low frequency adjust
	30.4			N/A	High frequency adjust
	30.5			N/A	Digital latch test
	31.0	31.0	N	N/A	Return to NF measurement
	31.1			N/A	Display test
	31.2			N/A	Keyboard test
	32.0	32.0	N	N/A	Return to NF measurement
	32.1			N/A	Memory board RAM test
	32.2			N/A	CPU board RAM test
	32.3			N/A	Scope/Plotter RAM test
	33.0	33.0	N	N/A	Return to NF measurement
	33.1			N/A	ROM-1 checksum
	33.2			N/A	ROM-2 checksum
	33.3			N/A	ROM-3 checksum
	33.4			N/A	ROM-4 checksum
	33.5			N/A	ROM-5 checksum
	33.6			N/A	ROM-6 checksum
	33.7			N/A	Total checksum of ROM's 1-6
	34.0	34.0	N	N/A	Return to normal measurement
	34.1			N/A	DMAC chip test
	34.2			N/A	GPIB chip test
	34.3			N/A	Math chip test
	35.0	35.0	N	N/A	Normal measurement
	35.1			N/A	RF Gain peak search
	36.0				Not used
	37.0	37.0	N	R0	Auto RF attenuator
	37.1			R1	Fixed RF attenuator at 0 dB

Table 1-8. Special Functions Table (Continued)

Function Type	SF Code	Power Up	S/ R	GPIB Code	Function Description
	37.2 37.3 37.4 37.5			R2 R3 R4 R5	Fixed RF attenuator at 15 dB Fixed RF attenuator at 30 dB Fixed RF attenuator at 40 dB Fixed RF attenuator at 55 dB
	38.0 38.1 38.2 38.3 38.4 38.5	38.0	N	I0 I1 I2 I3 I4 I5	Auto IF atten (mutually exclsv with 39.x) Fixed IF attenuator at 0 dB Fixed IF attenuator at 5 dB Fixed IF attenuator at 10 dB Fixed IF attenuator at 15 dB Fixed IF attenuator at 20 dB
	39.0 39.1 39.2 39.3 39.4 39.5	39.0	N	N/A I6 I7 I8 I9 IA	Auto IF atten (mutually exclsv with 38.x) Fixed IF attenuator at 25 dB Fixed IF attenuator at 30 dB Fixed IF attenuator at 35 dB Fixed IF attenuator at 40 dB Fixed IF attenuator at 45 dB
SRQ Configuration (for GPIB)	40.0 40.1 40.2	40.0	Y	N/A N/A N/A	Normal addressable talker/listener mode Talk-only mode Controller mode (addressing external LO)
	41.0 41.1				Not used
Service Request	42.0 42.1	42.0	N	NI RA	All SRQ's disabled SRQ on "data ready"
Service Request	43.0 43.1	43.0	N	NI RC	All SRQ's disabled SRQ on "calibration complete"
	44.0 44.1				Not used
Service Request	45.0 45.1	45.0	N	NI RT	All SRQ's disabled SRQ on "ready to tune"
Service Request	46.0 46.1	46.0	N	NI RI	All SRQ's disabled SRQ on instrument error
External LO Control Program Selection	47.0 47.1 47.2 47.3 47.4	PREV	Y	N/A N/A N/A N/A N/A	Control program for HP 8672 LO Control program for Wiltron 6600 Sweeper Not used Control program for HP 8350A Control program written by user (48.1)
External LO Control Program Parameters	48.0 48.1	48.0	N	N/A N/A	Normal measurement Enter user defined control program for external LO

Table 1-8. Special Functions Table (Continued)

Function Type	SF Code	Power Up	S/ R	GPIB Code	Function Description
GPIB Output Format Selection	49.0	PREV	N	F0	Output Window C data only to GPIB
	49.1			F1	Output Window B data only to GPIB
	49.2			F2	Output Window A data only to GPIB
	49.3			F3	Output Window A and B data to GPIB
	49.4			F4	Output Window A and C data to GPIB
	49.5			F5	Output Window B and C data to GPIB
	49.6			F6	Output Window A, B, and C data to GPIB

On a front panel PRESET (GPIB Device Clear) condition, the special functions in this table will assume the same status as given in the "Power Up" column.

On a Total System Reset (Special Function 0.9), all of the special functions in this table will assume the zero condition. For example, SF 2.x will revert to 2.0; SF 4.x will revert to 4.0, etc. The only exceptions to this are:

Special Function 1.x will revert to 1.1.

Special Function 7.x will revert to 7.2 or 7.6.

Special Function 16.x will revert to 16.1.

Special Function 47.x will revert to its previous setting.

1-11. POWER-ON CONDITIONS, PRESET, AND TOTAL SYSTEM RESET

Power-On Conditions

When the 2075 is powered-on, it automatically performs a series of self-tests. These check the operation of the Math Processor, RAM's, ROM's,GPIB Controller Chip, the Direct Memory Access Controller (DMAC), and the Scope/Plotter output interface. Finally, the instrument performs a Frequency Calibration (FCAL) which ensures the accuracy of its frequency tuning. Immediately after placing the POWER switch in the ON position, the following correct indications will be observed:

1. All front panel red LED's and indicators light briefly.
2. The words SELF TEST appear in Windows A and B while the numbers 1 through 6 appear sequentially in Window C.
3. The message FCAL appears briefly in Window B.

When the frequency calibration is completed, the instrument restores the frequency and control parameters it had before it was last powered-off, except for the following:

The instrument is in LOCAL mode.

The instrument is in Fixed Frequency Mode and is tuned to the last frequency set prior to power-down.

The measurement mode is Uncorrected (Cascade) Noise Figure.

The instrument is in the Continuous Measurement Mode (it is continuously making measurements).

Previous Second Stage Calibration data is lost.

The SRQ (Service Request) function is disabled.

Some special functions are restored to their previous values and others revert to their default or .0 state. For a complete listing of power-on control parameters see Column 2 of Table 1-9.

Preset

The **PRESET** key can be pressed at any time to restore certain control parameters to known preset values. This feature is typically used after a power-on or when previous control parameters are unknown. Some parameters and special functions are not affected by the PRESET function and will remain in their previous states. See Column 3 of Table 1-9 for a complete list of PRESET parameter values.

Total System Reset

This is a special function which erases all previous frequency and control parameters including ENR tables. After the parameters are erased, some are automatically replaced with values from ROM. This special function is typically used as a security measure after confidential measurements have been made. It should also be performed after the 2075 has been unused for a long enough period of time that the data in battery backed-up RAM may be unreliable. To do a Total System Reset press:

SPEC FUNC 0.9 ENTER

After the system reset, an IF Attenuator Calibration (Special Function 19.1) must be performed.

Column 4 of Table 1-9 shows what control parameter values are in effect after the total system reset is performed.

Column 5 of Table 1-9 shows which control parameters can be stored in the STORE-RECALL registers.

Table 1-9. Power-On, Preset, and Total System Reset Parameters

This is a listing of all the control parameters and special functions settings which are in effect after a Power-up, Preset, or Total System Reset via Special Function 0.9. The last column shows which control parameters can be stored in the Store-Recall registers.

PARAMETER	POWER ON	PRESET or DEVICE CLEAR	TOTAL SYSTEM RESET (SP FN 0.9)	STORABLE IN REGISTERS
INPUT PARAMETERS				
Tuned Frequency	N.C.	30 MHz	30 MHz	YES
Start Frequency	N.C.	10 MHz	10 MHz	YES
Stop Frequency	N.C.	1900 MHz	1900 MHz	YES
Swept Frequency Step Size	N.C.	20 MHz	20 MHz	YES
Fixed Frequency Step Size	N.C.	20 MHz	20 MHz	YES
Fixed Frequency Step Size	N.C.	20 MHz	20 MHz	YES
Ext LO 1 Frequency	N.C.	1000 MNz	1000 MHz	YES
Ext LO 2 Frequency	N.C.	1000 MHz	1000 MHz	YES
Int IF Frequency	N.C.	30 MHz	20 MHz	YES
LO Settling Time	N.C.	N.C.	100 msec	
LO Power Level	N.C.	0 dBm	0 dBm	YES
RF Frequency	N.C.	N.C.	10 MHz	
RF Start Frequency	N.C.	N.C.	10 MHz	
RF Stop Frequency	N.C.	N.C.	1900 MHz	
RF Sweep Delta	N.C.	N.C.	20 MHz	
RF Step Size	N.C.	N.C.	20 MHz	
SCOPE/PLOTTER PARAMETERS:				
Noise Upper Limit	30	30	30	YES
Noise Lower Limit	0	0	0	YES
Gain Upper Limit	80 dB	80 dB	80 dB	YES
Gain Lower Limit	-20 dB	-20 dB	-20 dB	YES
LOSS COMPENSATION PARAMETERS:				
Loss Before DUT	0 dB	0 dB	0 dB	
Loss After DUT	0 dB	0 dB	0 dB	
Temperature of Losses	290 k	290 k	290 k	
BANDWIDTH COMPENSATION PARAMETERS:				
Bandwidth 1	5 MHz	5 MHz	5 MHz	
Bandwidth 2	5 MHz	5 MHz	5 MHz	
ENR Table Selection (sp fn 5)	N.C.	N.C.	TABLE 0	
ENR Tables	N.C.	N.C.	CLEAR ALL	
Nom ENR Value	N.C.	N.C.	15.5 dB	
T_{Hot} Entry	9893 k	N.C.	9893 k	YES
T_{Cold} Entry	296.0 k	N.C.	296.0 k	

N.C. = no change from previous set value

Table 1-9. Power-On, Preset, and Total System Reset Parameters (Continued)

PARAMETER	POWER ON	PRESET or DEVICE CLEAR	TOTAL SYSTEM RESET (SP FN 0.9)	STORABLE IN REGISTERS
BANDWIDTH COMPENSATION PARAMETERS (Continued):				
IF Calibration Data	SAVED	SAVED	CLEARED	
Second Stage Calibration Data	CLEARED	CLEARED	CLEARED	
Store/Recall Registers	SAVED	SAVED (and the current front panel is saved in register 0)	CLEARED	
Set Sequence	SAVED	SAVED	CLEARED	
SPECIAL FUNCTIONS:				
1	N.C.	1.1	1.1	YES
2	N.C.	2.0	2.0	YES
3	N.C.	3.0	3.0	
4	4.0	4.0	4.0	
5	N.C.	N.C.	5.0	YES
6	6.0	6.0	6.0	
7	(7.2 OR 7.6)		7.2	
8	8.0	8.0	8.0	
9	N.C.	9.0	9.0	
10	10.0	10.0	10.0	
11	11.1*	11.0	11.0	
12	N.C.	12.0	12.0	
13	13.1*	13.0	13.0	
14	14.0	14.0	14.0	
15	15.0	15.0	15.0	
16	16.1	16.1	16.1	
17	17.0	17.0	17.0	
18	18.0	18.0	18.0	
19	19.0	19.0	19.0	
20	20.0	20.0	20.0	
21	21.0	21.0	21.0	
22	22.0	22.0	22.0	
23	23.0	23.0	23.0	
24	N.C.	24.0	24.0	
30	30.0	30.0	30.0	
31	31.0	31.0	31.0	
32	32.0	32.0	32.0	
33	33.0	33.0	33.0	

* = is set to this value but is not active

Table 1-9. Power-On, Preset, and Total System Reset Parameters (Continued)

PARAMETER	POWER ON	PRESET or DEVICE CLEAR	TOTAL SYSTEM RESET (SP FN 0.9)	STORABLE IN REGISTERS
SPECIAL FUNCTIONS (Continued):				
34	34.0	34.0	34.0	
35	35.0	35.0	35.0	
36	36.0	36.0	36.0	
37	37.0	37.0	37.0	
38	38.0	38.0	38.0	
39	39.0	39.0	39.0	
40	40.0	40.0	40.0	YES
42	42.0	42.0	42.0	
43	43.0	43.0	43.0	
44	44.0	44.0	44.0	
45	45.0	45.0	45.0	
46	46.0	46.0	46.0	
47	N.C.	N.C.	47.0	YES
48	48.0	48.0	48.0	
49	N.C.	49.0	49.0	

* = is set to this value but is not active

1-12. SAFETY PRECAUTIONS

The following cautions and warnings should be followed when performing maintenance procedures on the 2075.

WARNING This symbol designates precautionary actions which must be followed to avoid the possibility of injury and death.

WARNING

1. If this instrument is to be energized via an auto-transformer for voltage reduction, make sure that the common terminal is connected to the earth pole of the power source.
2. The power cable plug shall be inserted into a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord without a protective conductor (ground).
3. Before switching on the instrument, the protective earth terminal of the instrument must be connected to the protective conductor of the power cord. This is accomplished by ensuring that the instrument's internal earth terminal is correctly connected to the instrument's chassis and that the power cord is wired correctly.

4. Whenever it is likely that the protection has been impaired, the instrument must be made inoperable and be secured against any unintended operation.
5. Any interruption of the protective ground conductor inside or outside the instrument, or disconnection of the protective earth terminal is likely to make the instrument dangerous. Intentional interruption is prohibited.
6. Make sure that only fuses with the required rated voltage and current, and of the specified type (normal-blow, slow-blow) are used for replacement. The use of repaired fuses and the short circuiting of fuse holders must be avoided. Remove the line cord before changing fuses.
7. Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, where inevitable, should be carried out only by a skilled person who is aware of the hazard involved.
8. Exercise extreme care when servicing the unit. High voltages are used.
9. Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source.

CAUTION This symbol designates precautionary actions which must be followed to avoid damage to all or part of the instrument.

CAUTION

1. Verify that the line voltage selector card on the rear panel is in the correct position before connecting the power.
2. Verify that the socket for the power line cord is provided with a protective earth contact.
3. Any interruption of the protective (grounding) conductor inside or outside the instrument is likely to cause damage to the instrument. To avoid damage, this instrument and all line powered devices connected to it must be connected to the same earth ground.
4. Make sure that only fuses with the required rating, and of the specified type are used for replacement. Fuse ratings are given on the rear panel of the instrument near the fuse holder.
5. To avoid the possibility of damage to test equipment, read completely through each section before starting it. Make any preliminary control settings necessary for correct test equipment operation.
6. Do not torque the RF connector to more than 2½ inch-pounds.

SECTION 2

PERFORMANCE VERIFICATION TESTS

2-1. INTRODUCTION

This section of the manual contains Performance Verification Tests which are used to verify that the 2075 is functioning in accordance with the specification requirements listed in Section 1. These procedures are normally performed upon receipt of the instrument, after repair or adjustment, or when the performance of the 2075 is suspect. These procedures should also be performed every six months to verify the continued optimum performance of the 2075.

2-2. TEST EQUIPMENT REQUIRED

The test equipment required for conducting the performance verification tests is listed in Table 2-1. For each item listed, the recommended manufacturer and model number is shown where appropriate. Minimum or critical parameters are also shown. Generally, it is desirable to use equipment with an accuracy four times greater than the parameter being tested. However, for the most part, these tests are internal checks performed by the 2075 and, therefore, accuracy of other test equipment is not important except for the Digital Voltmeter.

Test equipment warm-up is not critical for the first tests in this group. However, the 2075 should be warmed-up for at least 10 minutes before performing the Final Detector Linearity Test.

4/15/97

Table 2-1. Test Equipment Requirements for Performance Verification Testing

INSTRUMENT	MINIMUM PARAMETERS	RECOMMENDED MODEL
Digital Voltmeter	5½ digits	Fluke 8840A
Dual Channel Oscilloscope	Z-Axis blanking on positive-going TTL input	Tektronix 2213A
Calibrated Noise Source	10-1850 MHz min. frequency range	EATON 7618E or 7626
Test Cables with BNC Connectors		

2-3. PERFORMANCE VERIFICATION PROCEDURES

The Performance Verification Procedures are listed in Table 2-2. It is recommended that they be performed in the sequence listed. Access to the interior of the 2075 is not required for performance of these procedures. All tests are to be done at room temperature.

Table 2-2. Performance Verification Tests

PROCEDURE	PARAMETER OR FUNCTION VERIFIED
Power-on Test	Self-Test Functions
Noise Drive Voltage Test	Noise Drive Voltage Level
IF Attenuators Calibration	Calibration of IF Attenuators
Final Detector Bias Test	Bias Voltage Level
Second Stage Calibration	Noise Figure at each calibration step
Final Detector Linearity Test	Detector Linearity

2-4. POWER-ON TEST

This is a series of internal self-checks performed by the 2075 upon power-up. The unit checks the operation of its Math Processor, RAM, ROM, GPIB Controller, and its DMAC (Direct Memory Access Controller). Finally, the 2075 performs an FCAL (Frequency Calibration) to ensure the accuracy of its frequency tuning. No test equipment is required for this procedure.

Perform the following steps:

1. Connect the 2075 to an AC power source of the appropriate voltage.
2. Remove any devices connected to the RF INPUT.
3. Place the POWER switch in the ON position.
4. The following correct indications should be observed:
   a. All front panel red LED's and indicators light briefly.
   b. The words SELF and TEST appear in Windows A and B respectively, while the numbers 1 through 6 appear sequentially in Window C.

   NOTE

   Window A is the rectangular display on the left which is labeled FREQUENCY MHz. Window B is the display in the middle and is labeled GAIN. Window C is the one on the right labeled NOISE FIGURE.

   c. The message FCAL appears for several seconds in Window B.
   d. A frequency value is displayed in Window A and some numeric value will flash in Window C.
5. Press the **PRESET** key. The message FCAL will appear momentarily in Window B and then the frequency value in Window A may change.
6. After these steps have been completed, if no error messages have appeared, the 2075 has successfully completed the Power-up Test.

2-5. NOISE DRIVE VOLTAGE TEST

This procedure measures the DC voltage at the NOISE DRIVE output connector on the front panel of the 2075. This voltage should be +28.00 volts, ± .050 volts.

A 5½ digit, digital voltmeter is required.

1. Set the POWER switch to the ON position.
2. Remove any devices connected to the RF INPUT.
3. Press:

   SPEC FUNC 20.2 ENTER

   This special function causes the 2075 to apply the noise drive voltage to the BNC connector. The green NOISE DRIVE LED will light.
4. Connect the DVM leads to the NOISE DRIVE connector and take the voltage reading.
5. The voltage should be +28.00 volts DC ± .050 volts.
6. Press the ON/OFF key.
7. Verify that the green NOISE DRIVE LED is off and that the voltage at the NOISE DRIVE connector is less than +1.0 volt DC.
8. This concludes the Noise Drive Voltage Test.

2-6. IF ATTENUATORS CALIBRATION

In this procedure the 2075 measures the changes in gain caused by adding different levels of internal IF attenuation and then stores those attenuator values.

No test equipment is required for this procedure.

1. Place the POWER switch in the ON position.
2. Remove any devices connected to the RF INPUT.
3. Press:

   SPEC FUNC 19.1 ENTER
4. The word CAL0 appears in Window B and the letters IF appear in Window C.
5. The words CAL1, CAL2, CAL3 and CAL4 will appear sequentially in Window B while the unit continues to calibrate its IF stages.
6. When a frequency value appears in Window A, and some numeric value begins flashing in Window C, this calibration procedure is successfully completed.

2-7. FINAL DETECTOR BIAS TEST

This procedure measures the bias voltage on the final detector.

No test equipment is required for this procedure.

1. Place the POWER switch in the ON position.
2. Press:

   SPEC FUNC 37.5 ENTER

   This causes the 2075 to place 55 dB of attenuation in its RF stage.
3. The value 55 dB should appear in Window B, and 0 dB should appear in Window C.
4. Press:

   SPEC FUNC 39.5 ENTER

   This causes the 2075 to place 45 dB of attenuation in its IF stages.
5. The value 45 dB will appear in Window C.
6. The value of the detector bias voltage is displayed in Window A. This voltage must be between .012 and .028 volts (12 to 28 millivolts). If the least significant digits of the display are changing too rapidly to read, add smoothing by pressing the **RIGHT ARROW** key several times.
7. The test is complete at this point but the 2075 must be taken out of the test mode by completing the following steps.
8. Press:

   SPEC FUNC 37.0 ENTER

9. Press:

   SPEC FUNC | 39.0 | ENTER

10. Press the **F** key.

11. This concludes the Detector Bias Test procedure.

2-8. SECOND STAGE CALIBRATION

In the first part of this procedure frequencies and corresponding noise source ENR values are entered into an ENR table of the 2075 by the operator. Then the 2075 measures its own second stage noise figure at different frequencies and gain levels, and stores these values.

A calibrated noise source is required for this procedure.

Perform the following steps:

1. Select the noise source which will be used to make the measurements.

2. Apply AC power to the 2075.

3. Allow several seconds for the 2075 to complete its automatic power-up self tests. These are completed when the message FCAL has appeared in, and then disappeared from, Window B.

4. Press the **PRESET** key. Wait until the new FCAL message disappears from Window B, signifying that the frequency calibration is completed. Preset restores the control parameters to a set of known values.

5. Press:

   SPEC FUNC | 5.1 | ENTER

   This calls up, or activates, Table 1. The data about to be entered will be stored in Table 1 (5.2 would have called up Table 2 and 5.3 would have called up Table 3). The error message 104 may appear indicating that no data is currently stored. If so, it may be disregarded.

6. Press:

   ENR

   This places the 2075 in the mode which allows entry of the frequencies and ENR values. The red light in the center of the ENR key is illuminated. Also, the ENTER annunciator in Window A begins to blink signifying that the operator is required to enter a frequency.

7. Enter the first calibration frequency, in MHz, from the noise source calibration data sheet (for example, 10 MHz) by pressing:

   10 | ENTER

   The frequency just entered appears in Window A. The ENTER annunciator in Window B begins to blink signifying that the operator is required to enter the ENR value, in dB, for the frequency just entered.

8. Read the ENR value for the frequency just entered from the noise source calibration data sheet, or the inscribed label on the calibrated noise source. Enter this value by pressing:

   numeric keys | ENTER

   The value just entered appears in Window B. This completes the entries for the first frequency. The ENTER annunciator in Window A begins to blink, indicating that the next frequency should be entered.

9. Enter the next frequency, in MHz, from the noise source calibration data sheet by pressing:

   numeric keys | ENTER

   The frequency just entered appears in Window A. The ENTER annunciator in Window B begins to blink, signifying that the ENR value for that frequency should now be entered. ENR values are always entered in decibels.

10. Enter the ENR value by pressing:

    numeric keys ENTER

    The value just entered appears in Window B. Now the ENTER annunciator in Window A will start to blink again, indicating that the next frequency should be entered.

11. Continue to enter paired frequency and ENR values for all data points shown on the noise source calibration data sheet.

12. After all the entries have been made, use the **DOWN ARROW** and **UP ARROW** keys to examine the entries for correctness. Step down through the table by pressing or holding **DOWN ARROW**. Step up through the table by pressing or holding **UP ARROW**.

    To clear an erroneous entry, first display it using the up or down arrow keys and then press the **CLEAR** key. Both the frequency and the ENR value will be cleared. Then enter the correct value. The **ENTER** key can be used to toggle the ENTER annunciator back and forth between Window A and Window B. See paragraph 3-31 for more information.

    To clear the entire table, press:

    SHIFT CLEAR

13. Press:

    ENR

    This takes the 2075 out of the ENR table entry and display mode. The red light in the center of the **ENR** key will go out.

This completes the entry of ENR data. Continue with the following steps to perform the Second Stage Calibration.

14. Connect the noise source to the RF INPUT connector and the NOISE DRIVE connector. Press:

    CALIB

15. The 2075 will now display an FCAL, CAL0, CAL1, CAL2, and CAL3 as it performs these steps of the calibration process.

16. During the CAL1, while the unit takes 20 MHz steps, verify that the noise figure displayed in Window C is less than 7.0 dB ±.001 dB/MHz from 10 MHz to 1850 MHz. The noise figure at 1850 MHz should be less than 8.85 dB. As the 2075 steps up to 1900 MHz, the noise figure may go above 8.85 dB.

17. During the CAL2, while the 2075 takes 20 MHz steps across the frequency band, verify that the noise figure displayed in Window C is less than 13.0 dB from 10 MHz to 1850 MHz.

18. During the CAL3, while the unit takes frequency steps across the band, verify that the noise figure displayed in Window C is less than 28.0 dB from 10 MHz to 1850 MHz.

19. After the 2075 has completed the CAL3, it will return to the start frequency and display values for corrected noise figure and gain. Since nothing has been inserted between the calibrated noise source and the RF INPUT, these values should be 0, with slight random variations.

If the noise figure is excessively high during steps 15 to 17, then see Paragraph 5-16 in the Troubleshooting section. This concludes the Second Stage Calibration Procedure.

2-9. FINAL DETECTOR LINEARITY TEST

This procedure measures the linearity of the final detector by adding different levels of IF attenuation. For each level, the 2075 measures its own noise figure and the output voltage of the final detector.

A calibrated noise source is required for this test.

The 2075 must be warmed-up for at least 10 minutes before performing this test.

1. Place the POWER switch in the ON position.

2. Connect the calibrated noise source to the RF INPUT.

4.7 58

3. Tune the 2075 to 30 MHz by pressing:

   30 ENTER

   Window A will display 30 MHz.

4. Press the **F** key. This puts the 2075 into the uncorrected noise figure mode.

5. Press the **RIGHT ARROW** key four or five times to add smoothing and slow the random changes of the noise figure value now displayed in Window C.

6. Record the noise figure value displayed in Window C. This value should be less than 6 dB.

7. Press:

   SPEC FUNC 20.2 ENTER

8. The value now displayed in Window A is the output voltage of the final detector. Verify that this value is less than 4.98 volts. Window B displays a 0 indicating that no attenuation is being applied to the RF stage. Window C displays some value which is the amount of attenuation being applied to the IF stages, usually 5 or 10 dB.

8a. Press the **ON/OFF** key.

The green NOISE DRIVE light will go out.

8b. Verify that the voltage now displayed in Window A is greater than .20 volts.

8c. Note the value of IF attenuation displayed in Window C. Use the following table to determine which special function will be required to enable the next higher value of IF attenuation.

SPECIAL FUNCTION	IF ATTENUATION
38.0	Auto-ranging
38.1	0 dB
38.2	5 dB
38.3	10 dB
38.4	15 dB
38.5	20 dB
39.0	Auto-ranging
39.1	25 dB
39.2	30 dB
39.3	35 dB
39.4	40 dB
39.5	45 dB

8d. If the value displayed in Window C is 5, then enter special function 38.3 to enable the 10 dB IF attenuator.

9. Press:

   SPEC FUNC 38.3 ENTER

   This will place 10 dB of IF attenuation in the line. Window C displays a 10.

10. Verify that the detector voltage displayed in Window A is less than 4.98 volts.

11. Press the **ON/OFF** key.

    The green NOISE DRIVE light will go out.

12. Verify that the voltage now displayed in Window A is greater than .20 volts.

13. Press the **F** key.

    This returns the 2075 to the Noise Figure measurement mode. The green NOISE DRIVE light will begin to blink.

14. Record the noise figure value displayed in Window C. This value should be virtually equal to the value recorded in Step 6.

15. Press:

    SP FN | 38.4 | ENTER

    This places 15 dB of IF attenuation in line. Window C will display 15 dB.

16. Verify that the detector output voltage, displayed in Window A, is less than 4.98 volts.

17. Press the **ON/OFF** key.

    This turns off the noise drive voltage and causes the green light to go out.

18. Verify that the detector output voltage displayed in Window A is greater than .20 volts.

19. Press the **F** key.

    This returns the 2075 to the noise figure measurement mode.

20. Record the noise figure value displayed in Window C.

    This value should be virtually the same as those recorded in Steps 6 and 14.

21. Press:

    SPEC FUNC | 38.5 | ENTER

    This will place 20 dB of IF attenuation in the line. Window C will display 20 dB .

22. Verify that the detector output voltage displayed in Window A is less than 4.98 volts.

23. Press the **ON/OFF** key.

    This turns off the noise drive voltage.

24. Verify that the detector output voltage displayed in Window A is greater than .20 volts.

25. Press the **F** key.

26. Record the noise figure value displayed in Window C. This value should be virtually equal to the values recorded in Steps 6, 14, and 20.

27. The noise figure recorded in steps 6, 14, 20 and 26 should agree within .03 dB of each other.

28. Press:

    SPEC FUNC | 38.0 | ENTER

    This returns the 2075 to its attenuation autoranging mode.

This concludes the Final Detector Linearity Test. 1/15/91 pd

2-10. SCOPE/PLOTTER OUTPUT TEST

This test verifies the proper functioning of the X, Y, and Z outputs which are used to drive an external oscilloscope or plotter.

This procedure requires either a dual channel oscilloscope with an X-Y mode or an X-Y plotter.

1. Locate the BNC connectors marked X, Y, and Z on the rear panel of the 2075. Install test cables between these and the X, Y, and Z inputs of the oscilloscope.

2. Locate the INT (INTENSITY) adjustment on the rear panel on the Eaton 2075. Rotate it fully clockwise.

3. Place the 2075 POWER switch in the ON position. Upon power-up the 2075 will automatically output a test pattern.

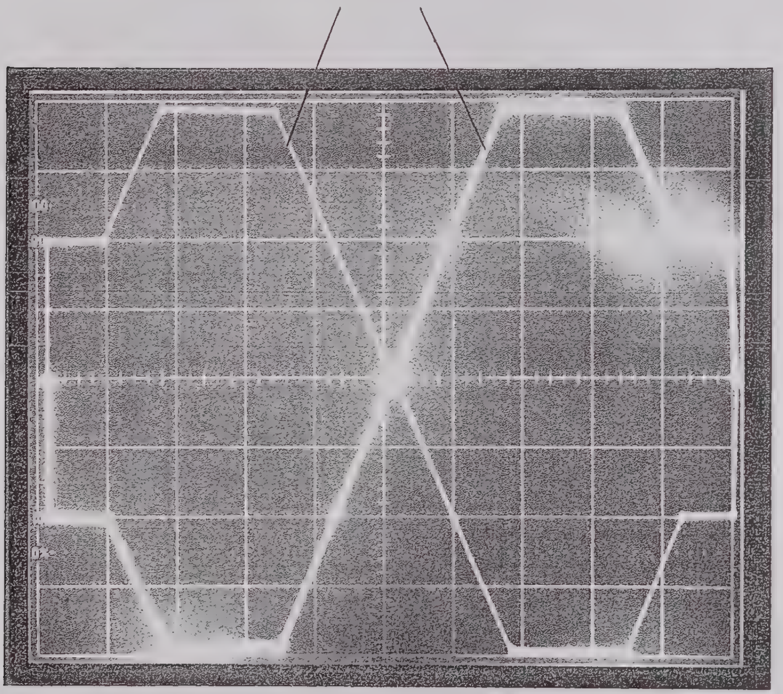
4. Adjust the amplitude controls on the oscilloscope so that the test pattern fills the display. It may be necessary to adjust the INT control on the rear of the 2075 to obtain a visible pattern.

NOTE

> For this test to work properly, the oscilloscope must reduce its intensity with a positive-going TTL signal applied to its Z input.

5. Adjust the INT potentiometer on the 2075 to dim half the test pattern.

6. The displayed test pattern should look like the one shown in Figure 2-1.



Adjust the INTENSITY Control on the 2075 rear panel to obtain a perceptible difference in intensity between the two halves of the pattern.

Figure 2-1. OUTPUT TEST PATTERN

7. Disconnect the test cable from the Z input of the oscilloscope.

8. Press:

   SPEC FUNC | 7.5 | ENTER

9. A dot will appear in the lower left corner of the oscilloscope display. This is the first alignment point used for aligning an X-Y plotter.

10. Press:

    SPEC FUNC | 7.6 | ENTER

11. A dot will now appear in the upper right corner. This is the second alignment point used for aligning an X-Y plotter.

This concludes the oscilloscope/plotter output test.

This concludes the performance verification tests.

SECTION 3

ALIGNMENT AND ADJUSTMENT PROCEDURES

3-1. INTRODUCTION

This section of the manual contains alignment and adjustment procedures for the Eaton 2075. These should be performed once every year to ensure the continued optimum performance of the instrument. Some of the procedures are for verification of specified parameters and others are performed to adjust the instrument.

The alignment and adjustment procedures are intended for use by skilled personnel who are qualified and experienced in the calibration of electronic test equipment. Alignment should not be attempted unless the proper test equipment is available and the instructions in these procedures are clearly understood.

3-2. REMOVAL OF COVER PANELS

The removal of cover panels is necessary to provide access to test points and adjustment points. Further disassembly is not required during alignment and adjustment.

Remove the 6-32 screw(s) which secures the top cover. Slide the cover to the rear and remove it from its grooves. Two internal cover panels are now exposed, and these must also be removed. The one on the right protects the RF assemblies. Remove the nine 4-40 screws from the RF cover and remove the cover. The cover on the left protects the digital assemblies. Remove the two 4-40 screws from the digital cover and remove the cover.

CAUTION

NEVER operate the 2075 with the top cover removed and the RF and digital covers still installed, or overheating will damage components. Always operate the unit with all three covers installed or with all three covers removed to prevent damage.

When access to the bottom of the instrument is required, remove the screw(s) in the bottom cover panel and slide the panel to the rear to disengage it from its grooves.

Figure 3-1 shows the location of the various assemblies in the 2075.

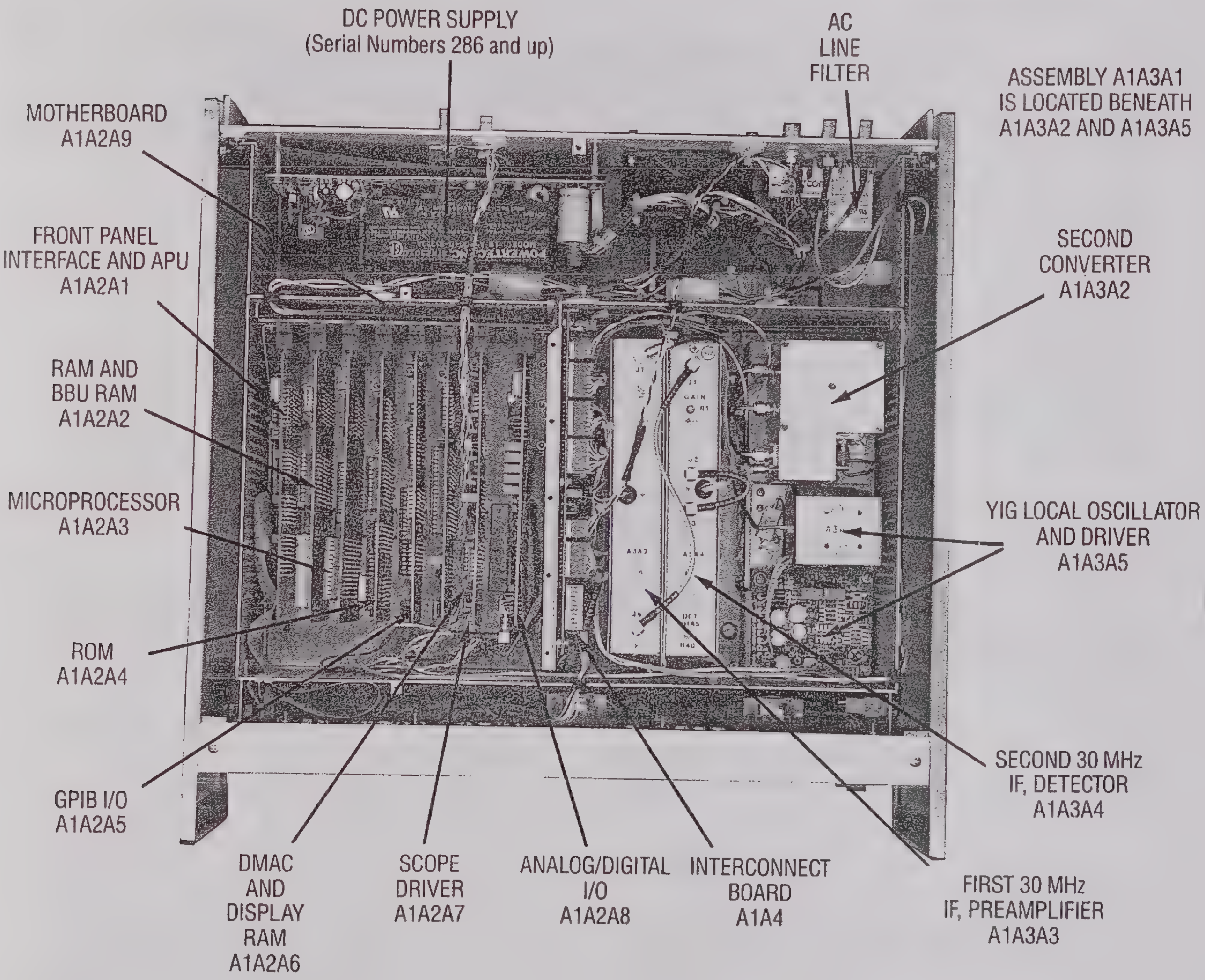

DC POWER SUPPLY
(Serial Numbers 286 and up)
AC
LINE
FILTER
ASSEMBLY A1A3A1
IS LOCATED BENEATH
A1A3A2 AND A1A3A5
MOTHERBOARD
A1A2A9
FRONT PANEL
INTERFACE AND APU
A1A2A1
SECOND
CONVERTER
A1A3A2
RAM AND
BBU RAM
A1A2A2
MICROPROCESSOR
A1A2A3
YIG LOCAL OSCILLATOR
AND DRIVER
A1A3A5
ROM
A1A2A4
SECOND 30 MHz
IF, DETECTOR
A1A3A4
GPIB I/O
A1A2A5
DMAC
AND
DISPLAY
RAM
A1A2A6
SCOPE
DRIVER
A1A2A7
ANALOG/DIGITAL
I/O
A1A2A8
INTERCONNECT
BOARD
A1A4
FIRST 30 MHz
IF, PREAMPLIFIER
A1A3A3

Figure 3-1. LOCATION OF ASSEMBLIES

3-3. TEST EQUIPMENT REQUIRED

The test equipment required for performing alignment and adjustment procedures is listed in Table 3-1. For each equipment item listed, minimum or critical performance parameters are shown as well as the recommended manufacturer and model number. If the recommended model is not available, the substituted equipment must meet the minimum parameters listed. All test equipment used must be in satisfactory operating condition and in calibration.

Table 3-1. Test Equipment Required For Alignment and Adjustment Procedures

ITEM	CRITICAL PARAMETERS	RECOMMENDED MODEL
Calibrated Noise Source	10-1850 MHz min. 15-16 dB ENR	Eaton 7618E
Digital Voltmeter	5 1/2 Digits min.	Fluke 8840A
Frequency Counter	10-4000 MHz	HP 5340A
Comb Generator	10 MHz and 100 MHz combs	HP 8406A
Calibrated Precision Voltage Source	0-5 V, .1 mV resolution	Datel Intersil DVC-8500A
Signal Generator	30 MHz CW	HP 8656A
Power Meter	30 MHz	HP 436A
Power Detector	−29 to −40 dBm range	HP 8484A
Power Splitter	6 dB	HP 11652-6009
10 dB Step Attenuator	accurate up to 2.0 GHz	HP 8495A
1 dB Step Attenuator	accurate up to 2.0 GHz	HP 8494A
30 dB Fixed Attenuator	Type N connectors	HP 8491 option 030
(3) 3 dB Fixed Attenuators	2 GHz	Midwest Microwave 238-3dB
Amplifier	approximately 30 dB gain from 700-4000 MHz	Mini Circuits ZHL-42
(2) Amplifiers	approximately 20 dB gain from 10-2000 MHz	Mini Circuits ZFL-2000

3-4. ALIGNMENT AND ADJUSTMENT PROCEDURES

Table 3-2 lists the alignment and adjustment procedures for the 2075. These should be performed at room temperature and in the sequence listed.

Table 3-2. Alignment and Adjustment Procedures

1. Power-On Test
2. Power Supply Voltages
3. Noise Drive Voltage
4. ROM Tests
5. RAM Tests
6. Chip Tests
7. 2170 MHz Second Oscillator
8. D/A Converter and YIG Driver
9. Frequency Accuracy
10. A/D Converter
11. Final Detector Bias
12. Final Detector Linearity
13. Final Detector Linearity and Slope
14. IF Attenuators Calibration
15. Overall Gain
16. Second Stage Calibration
17. RF Overload Detector
18. Gain Measurement Range and Accuracy

3-5. POWER-ON TEST

This is a series of internal self-checks performed by the 2075 upon power-on. The instrument checks the operation of its Arithmetic Processor Unit, RAM's, ROM's, GPIB Controller Chip, and the Direct Memory Access Controller (DMAC). Finally, the 2075 performs a Frequency Calibration (FCAL) to ensure the accuracy of its tuning.

No test equipment is required for this procedure.

Perform the following steps:

1. Connect the 2075 to an AC power source of the correct voltage.
2. Remove any devices connected to the RF INPUT.
3. Place the POWER switch in the ON position.
4. The following correct indications should be observed:
   a. All front panel red LED's and indicators light momentarily.
   b. The words SELF and TEST appear in windows A and B respectively, while the numbers 1 through 6 appear sequentially in window C. (Window A is the FREQUENCY MHz display. Window B is the GAIN display, located in the center, and window C is the NOISE FIGURE display, located on the right.)
   c. The message FCAL appears for several seconds in Window B.
   d. A frequency value is displayed in Window A and some numeric value may flash in Window C. (Noise Figure is less than 33 dB when nothing is connected to the RF INPUT connector.)
5. Press the **PRESET** key. The message FCAL will appear momentarily in Window B and the frequency value in Window A may change.
6. When the foregoing steps are completed and no error messages have appeared, the instrument has successfully completed the Power-On Test.

3-6. POWER SUPPLY VOLTAGES

This procedure is used to verify and adjust the DC voltages from the DC power supply.

Test equipment required for this procedure is:

Digital Voltmeter 5 1/2 digits	Fluke 8840A

NOTE

Use the following procedure for 2075's with serial numbers 286 and up. For 2075's with serial numbers 101 to 285, use the alternate procedure immediately following the first one. The alternate procedure consists of Steps 1A through 12A.

1. Set the POWER switch to the ON position.
2. Connect the negative DVM lead to the 2075 main chassis for grounding.
3. Connect the positive DVM lead to the pin 4 (red wire) of connector J1 located on the A1A4 board. See Figure 3-2 for the location.
4. The voltage reading should be +5.1 volts, ±.1 volt.

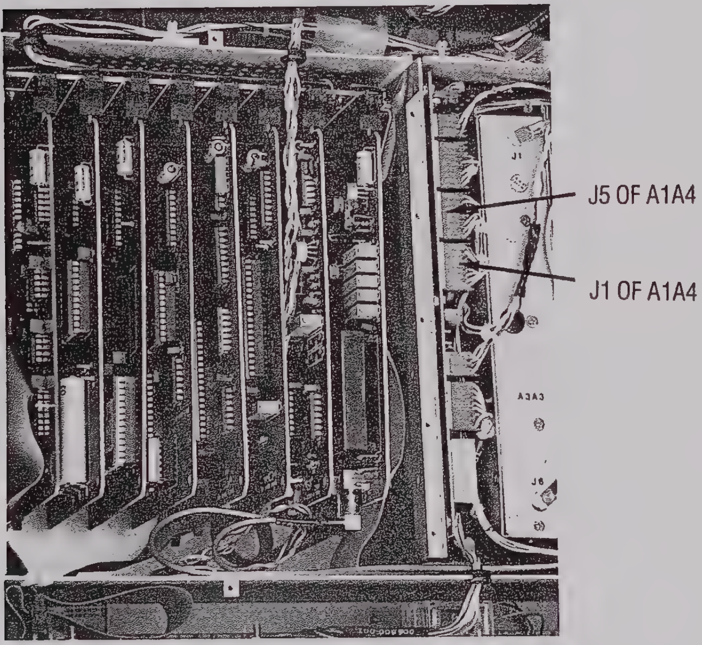


Figure 3-2. LOCATION OF J1 OF ASSEMBLY A1A4

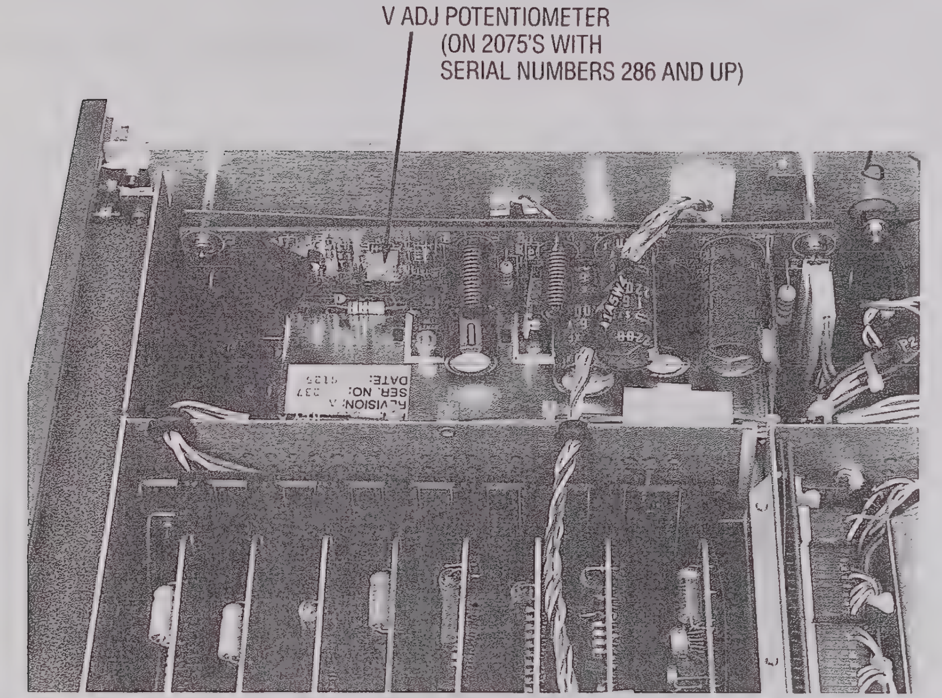


Figure 3-3. LOCATION OF V ADJ POTENTIOMETER

5. If the voltage is not within the specified range, adjust the VADJ potentiometer located on the power supply board. See Figure 3-3 for the location. Adjust the voltage to +5.1 volts ± .05 volts.

6. The VADJ is the only adjustment for the DC voltages. However, adjusting it will also change the other DC levels and these should be checked.

7. Connect the positive DVM lead to pin 3 (blue wire) of connector J1 of the A1A4 board. The voltage reading should be −15 volts, ± .2 volts.

8. Connect the positive DVM lead to pin 2 (yellow wire) of connector J1. The voltage reading should be +15 volts ± .2 volts.

9. Connect the positive DVM lead to pin 7 (orange wire) of connector J5. See Figure 3-2 for the location. The voltage reading should be +30 volts, +2.0 volts, −.5 volts.

10. This concludes the procedure.

NOTE

Use the following procedure to verify and adjust the power supply voltages for 2075's with serial numbers 101 to 285 inclusive. These units have two separate DC power supplies.

1A. Set the POWER switch to the ON position.

2A. Connect the negative DVM lead to the 2075 main chassis for grounding.

3A. Connect the positive DVM lead to pin 4 (red wire) of connector J1 located on the A1A4 board . See Figure 3-2 for the location of J1.

4A. The voltage reading should be +5.1 volts, ± .1 volts.

5A. If the voltage is not within the specified range, adjust the +5 volt potentiometer located on the power supply board. See Figure 3-4A for the location. Adjust the voltage to +5.1 volts ± .05 volts.

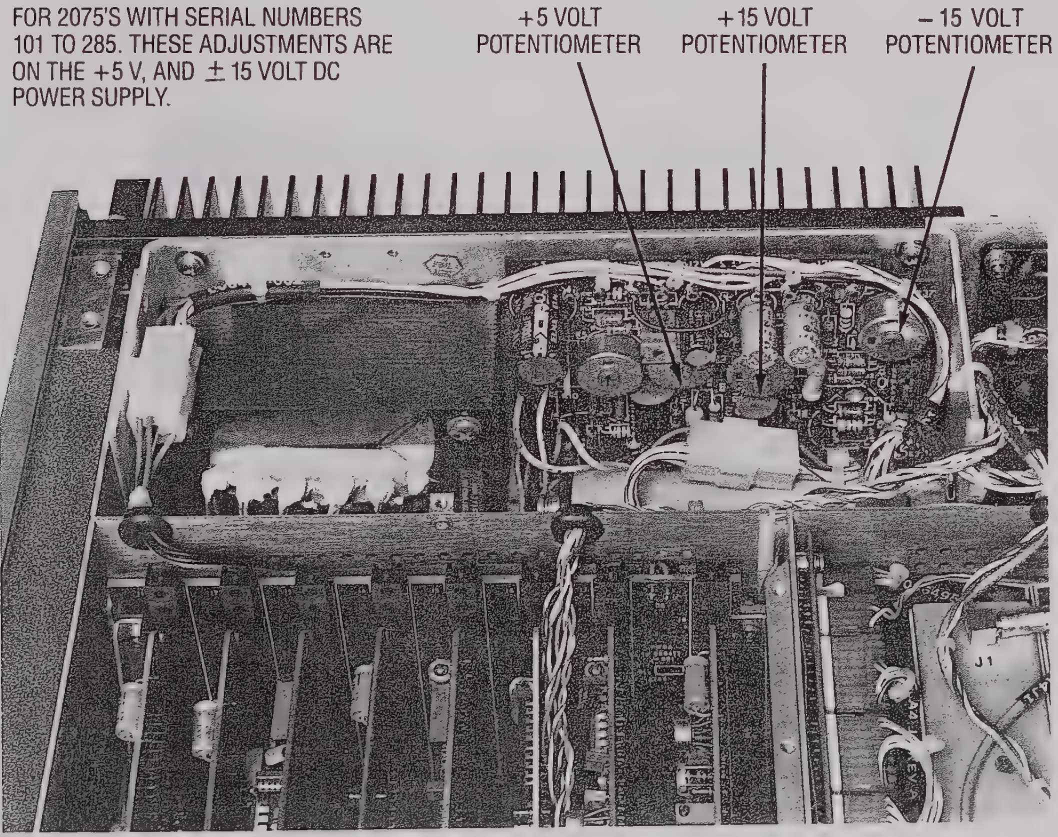

FOR 2075'S WITH SERIAL NUMBERS 101 TO 285. THESE ADJUSTMENTS ARE ON THE +5 V, AND ± 15 VOLT DC POWER SUPPLY.

Figure 3-4(a). LOCATIONS OF +5V, +15V, AND −15V POTENTIOMETERS

6A. Connect the positive DVM lead to pin 3 (blue wire) of connector J1 of the A1A4 board. See Figure 3-2 for the location. The voltage reading should be −15 volts, ± .2 volts.

7A. If the voltage is not within the specified range, adjust the −15 volt potentiometer on the power supply board. See Figure 3-4A for the location. (This potentiometer is labelled as −12 volts on the circuit board but it must be adjusted to −15 volts.)

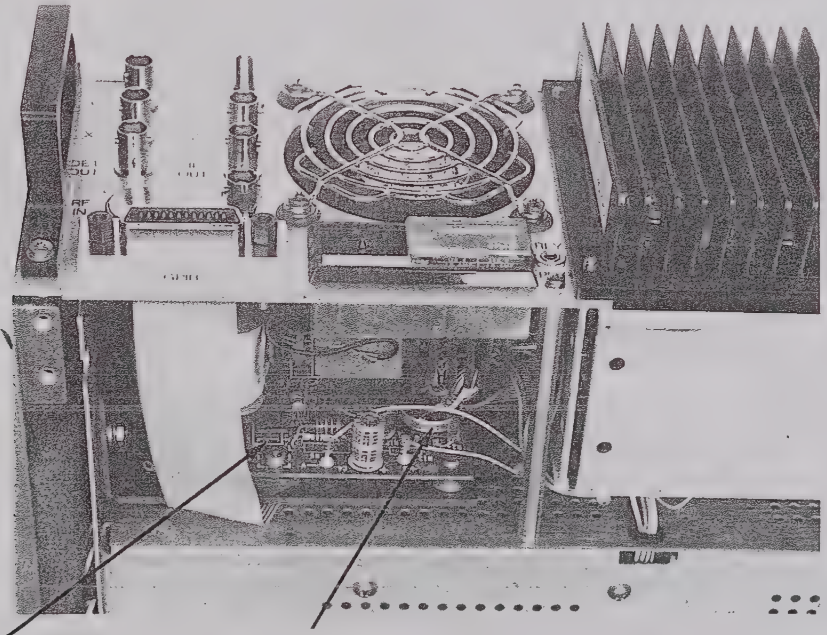
8A. Connect the positive DVM lead to pin 2 (yellow wire) of connector J1. See Figure 3-2 for the location. The voltage reading should be +15 volts, ± .2 volts.

9A. If the voltage is not within the specified range, adjust the +15 volt potentiometer on the power supply board. See Figure 3-4A for the location. (This potentiometer is labelled as +12 volts on the circuit board but it must be adjusted to +15 volts.)

10A. Connect the positive DVM lead to pin 7 (orange wire) of connector J5. See Figure 3-2 for the location. The voltage reading should be +30 volts, +2.0 volts, −.5 volts.

11A. The +30 volts comes from the +30 Power Supply.If the voltage is not within the specified range, turn the 2075 up on its left side and remove the bottom cover panel. See Figure 3-4B for the location of the +30 volt potentiometer. Adjust the pot to bring the voltage within the specified range.

12A. This concludes the procedure.



FOR 2075'S WITH SERIAL NUMBERS 101 TO 285. VIEW IS FROM BOTTOM REAR AND BOTTOM COVER PANEL IS REMOVED.

Figure 3-4(b). LOCATION OF +30 VOLTS POTENTIOMETER

3-7. NOISE DRIVE VOLTAGE

This procedure is performed to verify and, if necessary, adjust the DC voltage at the NOISE DRIVE output connector on the front panel on the 2075. This voltage should be adjusted to +28.000 volts, ± .005 volts.

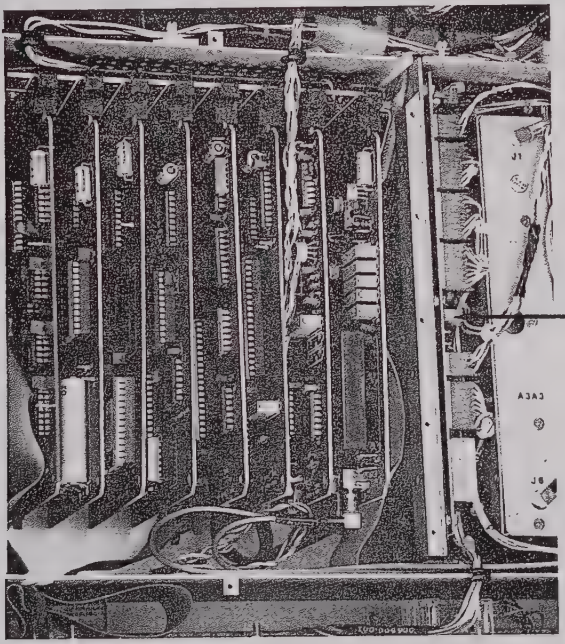
Test equipment required:

Digital Voltmeter
5 1/2 digits

1. Set the POWER switch to the ON position.
2. Remove any devices connected to the RF INPUT.
3. Press:

   SPEC FUNC   20.2   ENTER

   This special function causes the 2075 to apply the noise drive voltage to the NOISE DRIVE BNC connector. The Green LED should turn on.
4. Connect the digital voltmeter leads to the NOISE DRIVE connector and measure the voltage.
5. The voltage reading should be +28.000 volts, ± .005 volts.



R17 OF A1A4

Figure 3-5. LOCATION OF R17 OF A1A4

6. If necessary, adjust R17 on the A1A4 board to set the voltage to the +28 volts, ± .005 volts. Refer to Figure 3-5.
7. Press the **ON/OFF** key.
8. Verify that the green NOISE DRIVE LED is OFF. Verify that the voltage at the NOISE DRIVE connector has dropped to less than +1.0 volt.
9. This concludes the procedure.

3-8. ROM TESTS

The ROM tests are a series of internal self tests which provide a means of verifying the correctness of ROM contents. During each ROM test, all the bits stored in a ROM are added together. The resulting checksum is displayed in Window A. Compare the displayed checksum to the corresponding value listed in Table 6-3 and verify that the two are identical.

No test equipment is required for this test.

NOTE

The checksum values vary depending on the software update level of the 2075. To determine the SU level of the unit, press:

SPEC FUNC   8.1   ENTER

The software update of the instrument will be displayed in Window A. If the software update level is SU 5 use the checksum values in column 2 of Table 3-3. For SU 6 use the checksum values in column 3.

Table 3-3. ROM Checksum Values

	SU 5 CHECKSUM	SU 6 CHECKSUM
SP FN 33.1	b22a	AA0F
SP FN 33.2	1CCC	8745
SP FN 33.3	FEA8	A367
SP FN 33.4	b3E5	d106
SP FN 33.5	4F83	41FF
SP FN 33.6	d11A	176A
SP FN 33.7	A22O	FF7A

1. Set the POWER switch to ON.
2. Press:

   SPEC FUNC   33.1   ENTER

3. Compare the displayed checksum to the one in Table 3-3 and verify that they are identical.
4. Press:

   SPEC FUNC   33.2   ENTER

5. Compare the displayed checksum to the one in Table 3-3 and verify that they are identical.
6. Press:

   SPEC FUNC   33.3   ENTER

7. Compare the displayed checksum to the one in Table 3-3 and verify that they are identical.
8. Press:

   SPEC FUNC   33.4   ENTER

9. Compare the displayed checksum to the one in Table 3-3 and verify that they are identical.

10. Press:

    SPEC FUNC   33.5   ENTER

11. Compare the displayed checksum to the one in Table 3-3 and verify that they are identical.

12. Press:

    SPEC FUNC   33.6   ENTER

13. Compare the displayed checksum to the one in Table 3-3 and verify that they are identical.

14. Press:

    SPEC FUNC   33.7   ENTER

15. Compare the displayed checksum to the one in Table 3-3 and verify that they are identical.

16. This concludes the ROM tests.

3-9. RAM TESTS

The RAM tests are a series of internal self tests which verify that each of the three RAM sections is functioning properly. During each test the microprocessor puts a one in the first memory location, a two in the second location, and so on until all address locations are filled. Then the contents of that RAM are read and summed. The sum is compared to an internal, ROM stored checksum and if the two are equal, a blinking PASS message is displayed in Window A. Then the test is repeated in reverse order. The tests are performed repetitively and each successful completion is indicated by a PASS message. Each test can be stopped only by powering-down the 2075.

No test equipment is required for this test.

1. Place the POWER switch in the ON position.

2. Press:

   SPEC FUNC   32.1   ENTER

   This tests the battery backup RAM.

3. A PASS message will appear in Window A each time the test is successfully repeated.

4. Get out of the RAM test by placing the POWER switch in the OFF position and then wait 5 seconds before performing the next step.

5. Place the POWER switch in the ON position.

6. Press:

   SPEC FUNC   32.2   ENTER

   This will test the CPU RAM.

7. A PASS message will be displayed in Window A each time the test successfully repeats.

8. Get out of the test by powering-down the unit and then wait 5 seconds.

9. Place the POWER switch in the ON position.

10. Press:

    SPEC FUNC   32.3   ENTER

    This will test the Direct Memory Access Controller (DMAC) RAM.

11. A PASS message will be displayed in Window A each time the test successfully repeats.

12. Get out of the test by powering-down the unit.

13. This concludes the RAM tests.

3-10. CHIP TESTS

This series of internal self-checks verifies the operation of the DMAC (Direct Memory Access Controller), the GPIB Controller, and the Arithmetic Processor Unit.

No test equipment is required for these tests.

1. Set the POWER switch to the ON position.

2. Press:

   SPEC FUNC | 34.1 | ENTER

   This initiates the test of the DMAC Chip.

3. When the test is successfully completed a PASS message will appear in Window A and continue to blink each time the test repeats.

4. Press:

   SPEC FUNC | 34.2 | ENTER

   This initiates the test of the GPIB Controller Chip.

5. When the test is successfully completed a PASS message will appear in Window A and continue to blink each time the test repeats.

6. Press:

   SPEC FUNC | 34.3 | ENTER

   This initiates the test of the Math Chip.

7. A PASS message will appear in Window A when the test is successfully completed and will blink each time the test repeats.

8. Press:

   SPEC FUNC | 34.0 | ENTER

   This takes the 2075 out of the chip test mode.

10. This concludes the chip tests.

3-11. 2170 MHz SECOND OSCILLATOR ADJUSTMENT

This procedure is performed to verify and, if necessary, adjust the frequency of the 2170 MHz Oscillator, to 2170 MHz.

The following test equipment is required:

Frequency Counter	HP 5340A

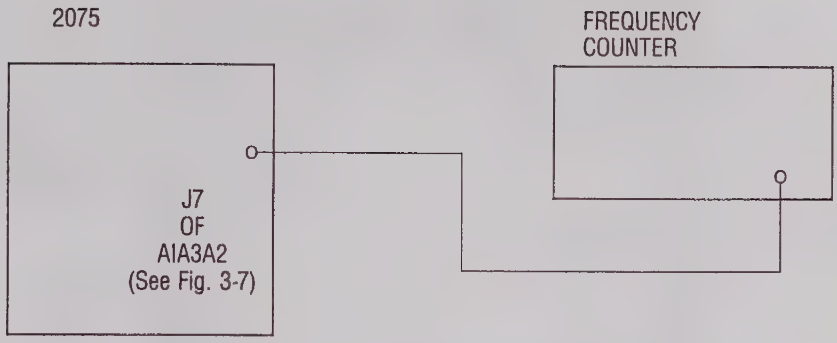

2075
FREQUENCY COUNTER
J7 OF AIA3A2 (See Fig. 3-7)

Figure 3-6. 2170 MHz SECOND OSCILLATOR ADJUSTMENT SETUP

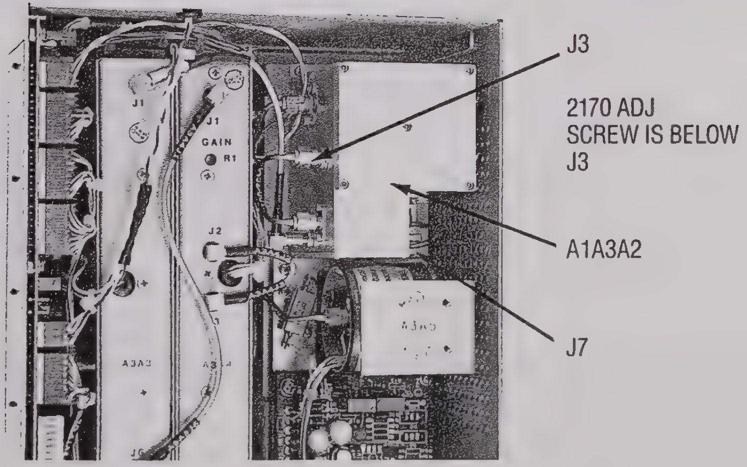

J3
2170 ADJ SCREW IS BELOW J3
A1A3A2
J7
J1
GAIN
R1
J2
A3A3

Figure 3-7. LOCATION OF J7 AND 2170 ADJ SCREW ON A1A3A2

1. Connect the test equipment as shown in Figure 3-6. Connect the test cable from the frequency counter input to connector J7 on assembly A1A3A2. The location of J7 is shown in Figure 3-7.
2. Set the POWER switch to ON.
3. The output signal frequency from J7 should be 2170 MHz, as indicated by the frequency counter.
4. If necessary, use a 5/64 hexagonal key to turn the 2170 ADJ screw on assembly A1A3A2 to obtain an output frequency of 2170 MHz. Turn the 2170 ADJ screw clockwise to lower the frequency, or counter-clockwise to increase it. See Figure 3-7.
5. This concludes the procedure.

3-12. D/A CONVERTER AND YIG DRIVER ADJUSTMENT

The Digital to Analog Converter receives digital values from the CPU and converts them to analog values which then tune the YIG local oscillator. This procedure is performed to verify that the analog voltages from the converter are accurate and that the local oscillator is tuning properly in response to these voltages.

The following test equipment is required for this procedure:

Frequency Counter	HP 5340A
Digital Voltmeter 5 1/2 digits	Fluke 8840A

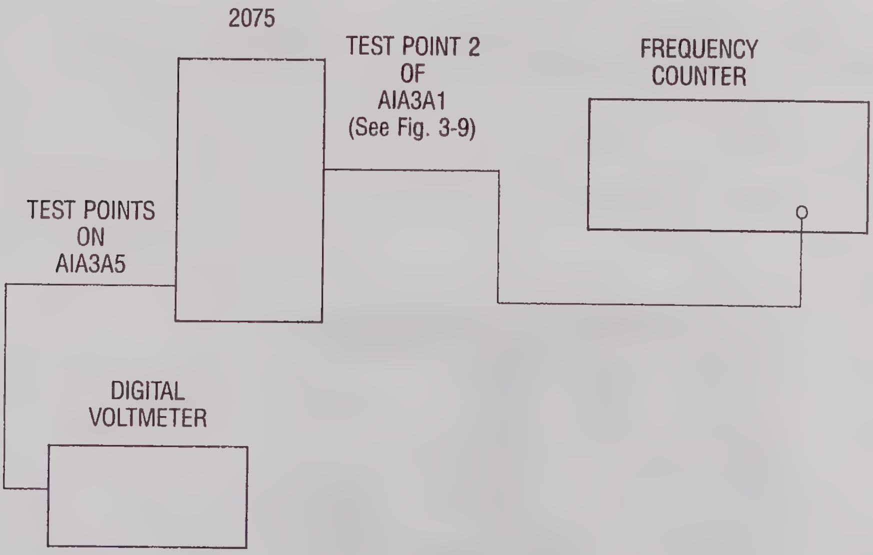


Figure 3-8. D TO A CONVERTER AND YIG DRIVER ADJUSTMENT SETUP

1. Turn the 2075 up on its left side and remove the bottom cover panel. The test setup is shown in Figure 3-8.
2. Connect the test cable between the frequency counter input and Test Point 2 on assembly A1A3A1. See Figure 3-9 for the location.

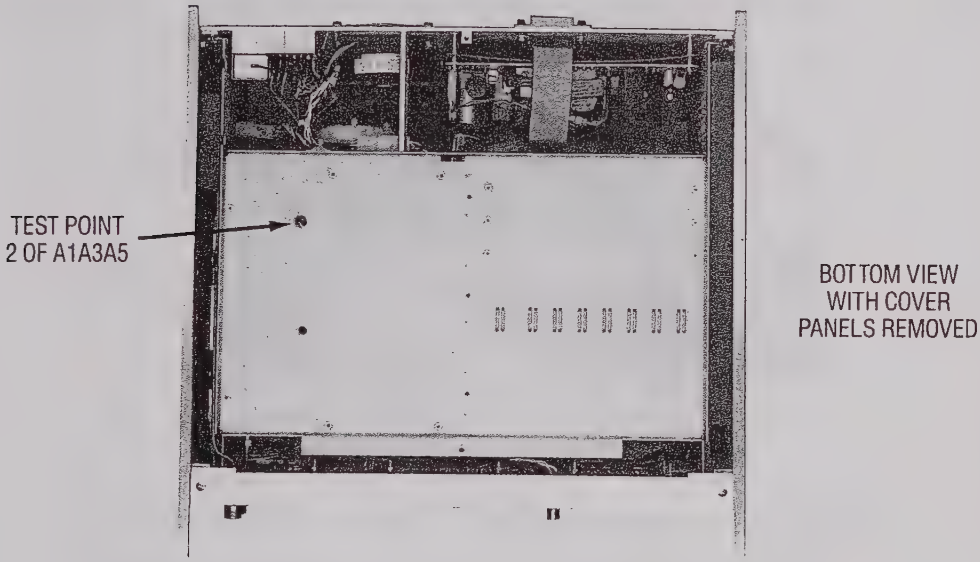

TEST POINT
2 OF A1A3A5
BOTTOM VIEW
WITH COVER
PANELS REMOVED

Figure 3-9. LOCATION OF TEST POINT 2 OF A1A3A5

3. Apply AC power to the 2075.
4. Connect the DVM leads to Test Points 3 and 4 of assembly A1A3A5. Test Point 4 is ground. See Figure 3-10 for the locations.

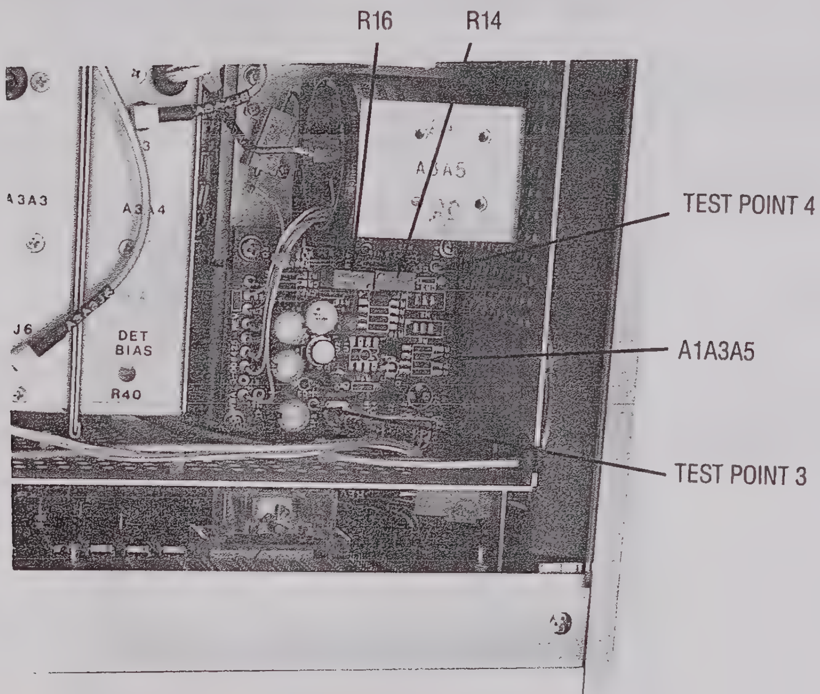

R16
R14
TEST POINT 4
A1A3A5
TEST POINT 3
A3A3
A3A4
A3A5
J6
DET BIAS
R40

Figure 3-10. LOCATION OF TEST POINTS 3 AND 4 OF A1A3A5

5. Press:

   SPEC FUNC | 30.2 | ENTER

   This causes the D/A Converter to output 0.000 volts ± .005 volts from Test Point 3.

6. Verify, using the DVM, that the voltage at Test Point 3 is 0.000 volts, ± .005 volts.

7. Press:

   SPEC FUNC | 30.3 | ENTER

   This causes the D/A Converter to output .072 volts from Test Point 3.

8. If necessary adjust resistor R1 on assembly A1A2A8 to obtain a voltage reading of exactly .072 volts from Test Point 3. See Figure 3-11 for the location of R1.

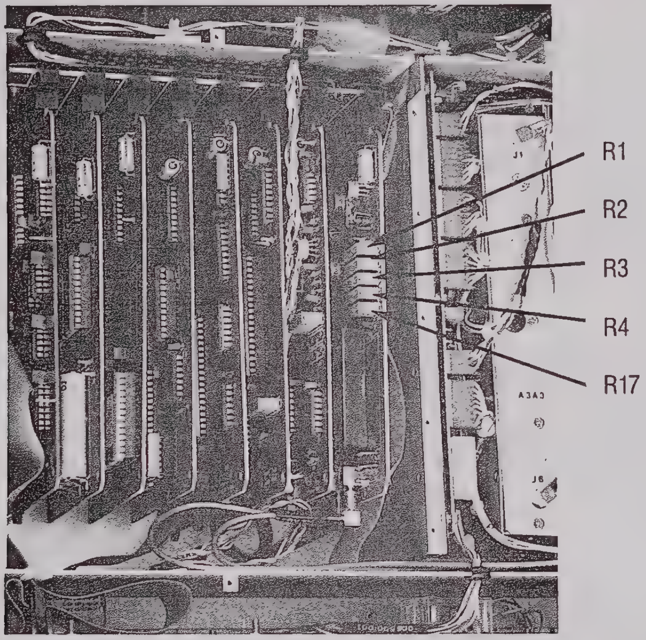


Figure 3-11. LOCATION OF POTENTIOMETERS ON A1A2A8

9. Check the frequency of the output from Test Point 2 of A1A3A1. The frequency counter should indicate 2200 MHz, ± .5 MHz.

10. If necessary, adjust resistor R14 on assembly A1A3A5 to obtain a 2200 MHz, ± .5 MHz output from Test Point 2. See Figure 3-10 for the location of R14.

11. Press:

SPEC FUNC 30.4 ENTER

12. The DVM should indicate 10.200 volts, ± .005 volts.

13. If necessary, adjust resistor R2 on assembly A1A2A8 to obtain a reading of 10.200 volts, ± .005 volts. See Figure 3-11 for the location of R2.

14. The frequency counter should indicate a frequency of 4000 MHz, ± .5 MHz.

15. If necessary, adjust resistor R16 on assembly A1A3A5 to obtain a reading of 4000 MHz, ± .5 MHz. See Figure 3-10 for the location of R16.

16. Press:

SPEC FUNC 30 3 ENTER

17. The DVM should indicate a reading of .072 volts from Test Point 3.

18. If necessary, readjust resistor R2 on assembly A1A2A8 to obtain an output of .072 volts.

19. Verify that the frequency counter indicates a frequency of 2200 MHz, ± .5 MHz.

20. If necessary, readjust resistor R14 on assembly A1A3A5 to obtain a frequency of 2200 MHz, ±.5 MHz.

21. Press:

    SPEC FUNC | 30.4 | ENTER

22. The DVM should indicate a reading of 10.200 volts, ±.005 volts.

23. If necessary, adjust resistor R2 on assembly A1A2A8 to obtain a voltage reading of 10.200 volts, ±.005 volts.

24. The frequency counter should indicate an output frequency of 4000 MHz, ±.5 MHz.

25. If necessary, adjust resistor R16 of assembly A1A3A5 to obtain an output frequency of 4000 MHz, ±.5 MHz.

26. Press:

    SPEC FUNC | 30.1 | ENTER

    This will force the YIG oscillator to some frequency less than 2000 MHz.

27. Verify that the frequency counter indicates an output frequency less than 2000 MHz.

28. Verify that the DVM indicates a voltage of approximately −2.0 volts.

29. This concludes the procedure.

3-13. FREQUENCY ACCURACY

This procedure is performed to examine the IF frequency of the 2075 and thereby verify the tuning accuracy of the 2075 across its input frequency range.

The following test equipment is required for this procedure:

Comb Generator	HP 8406A
Frequency Counter	HP 5340A
Amplifier, 20 dB gain	Mini Circuits ZFL-2000
DC Power Supply, +15 V	HP 721A

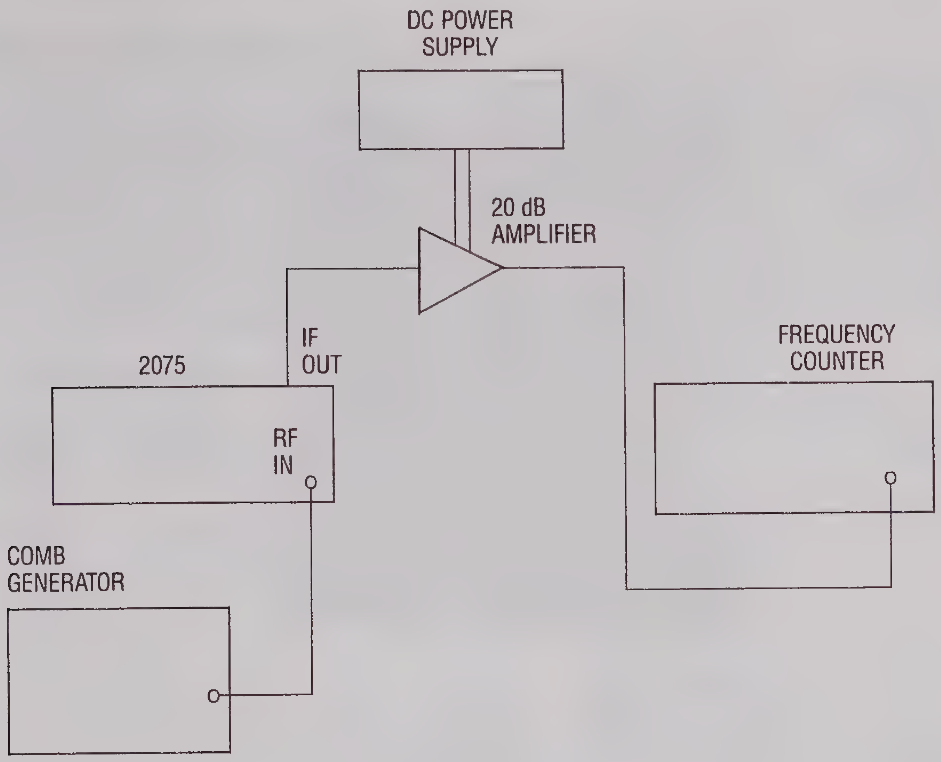


Figure 3-12. FREQUENCY ACCURACY SETUP

Perform the following steps:

1. Apply AC power to the 2075 and allow it to warm up for at least 15 minutes.
2. Tune the 2075 to 10 MHz by pressing:

   FIXED FREQ   10   ENTER

3. Perform a frequency calibration (FCAL) by pressing:

   SPEC FUNC   15.1   ENTER

4. Set up the test equipment as shown in Figure 3-12. Set the comb generator for a 10 MHz comb. Adjust the comb generator output level until the frequency counter displays a stable count of approximately 30 MHz.
5. Verify that the frequency counter reading is between 29.45 MHz and 30.55 MHz.
6. Tune the 2075 to 100 MHz by pressing:

   FIXED FREQ   100   ENTER

7. Set the comb generator for a 100 MHz comb. Adjust the output level until the frequency counter displays a stable count of 30 MHz.
8. Verify that the frequency counter reading is between 29.00 and 31.00 MHz.

9. Tune the 2075 successively higher in 100 MHz steps. For each step, note the reading on the frequency counter and verify that it is within the limits shown in Table 3-4 for each frequency. Repeat this step up to and including 1800 MHz. As the frequency is tuned higher, it may be necessary to increase the output level of the comb generator to obtain correct frequency readings from the frequency counter.

Table 3-4. IF Frequency Limits

2075 TUNED FREQUENCY IN MHz	IF FREQUENCY LIMITS
10	29.45 to 30.55
100	29.00 to 31.00
200	28.50 to 31.50
300	28.00 to 32.00
400	27.50 to 32.50
500	27.00 to 33.00
600 to 1800	27.00 to 33.00

3-14. A/D CONVERTER ADJUSTMENT

The Analog to Digital Converter accepts the analog output voltage from the Final Detector and converts it to a digital value which can be read by the CPU. This analog to digital conversion must be accurate in order for the 2075 to make accurate measurements. In this procedure a precision analog voltage is input to the converter and the digital output is verified and adjusted if necessary.

The following test equipment is required:

Calibrated Precision Voltage Source	Datel Intersil DVC-8500A
Digital Voltmeter 5 1/2 Digits	Fluke 8840A

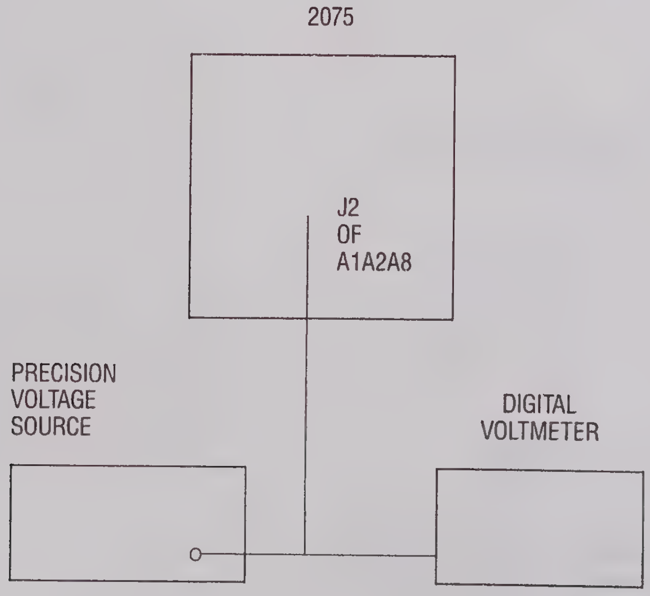


Figure 3-13. A TO D CONVERTER ADJUSTMENT SETUP

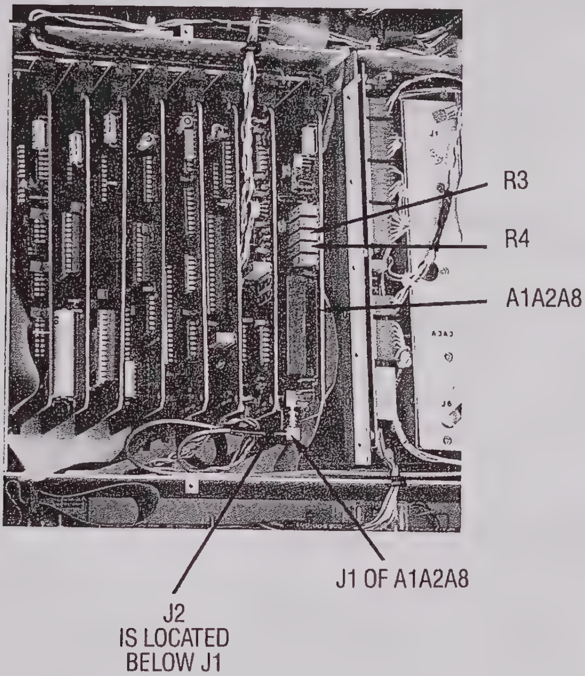


Figure 3-14. LOCATION OF J2 OF A1A2A8

1. Set up the test equipment as shown in Figure 3-13. Disconnect the cable from J2 of assembly A1A2A8. Connect the test cable from the output of the precision voltage source to J2. The location of J2 is shown in Figure 3-14.

2. Set the POWER switch to ON.

3. Adjust the precision voltage source to obtain an output of 0.0000 volts. Use the reading on the digital voltmeter as the reference when adjusting the voltage source output.

4. Press:

   SPEC FUNC | 20.1 | ENTER

   This places the 2075 into a voltmeter mode.

5. Window A displays the value of the voltage input to J2 of A1A2A8. Verify that this displayed value is 0.0000 volts with the fourth digit to the right of the decimal point (representing tenths of a millivolt) changing from a 0 to a 1 and back again.

6. If necessary, adjust variable resistor R3 of A1A2A8 to obtain the displayed value described in Step 5. See Figure 3-14.

7. Adjust the voltage source to obtain an output of 4.980 volts, using the digital voltmeter reading as the reference.

8. Verify that the Window A display shows 4.980 volts ± .0001 volts.

9. If necessary, adjust variable resistor R4 on assembly A1A2A8 to obtain a readout of 4.980 volts ± .0001 volts.

10. To verify the adjustment, adjust the voltage source output back to 0.0000 volts using the DVM reading as the reference.
11. Verify that Window A displays 0.0000 volts. The fourth digit to the right of the decimal point may be changing from a 1 to a 0 and back again in Window A.
12. Repeat steps 3 through 9 until no further adjustment is required.
13. Disconnect the test cable from J2 of A1A2A8 and reconnect the original cable.
14. This concludes the A/D Converter Adjustment Procedure.

3-15. FINAL DETECTOR BIAS

This procedure is performed to verify the bias voltage on the Final Detector. However, if the bias voltage requires adjustment, the adjustment will be performed as part of the procedure of Paragraph 3-17.

No test equipment is required for this procedure.

1. Place the POWER switch in the ON position.
2. Press:

   SPEC FUNC | 37.5 | ENTER

   The 2075 will place 55 dB of attenuation in its RF stage.
3. The value 55 dB should appear in Window B and 0 dB should be displayed in Window C.
4. Press:

   SPEC FUNC | 39.5 | ENTER

   This will cause the 2075 to add 45 dB of attenuation to its IF stage.
5. Verify that the value 45 dB is displayed in Window C.
6. The value of the detector bias voltage is now displayed in Window A. This voltage must be between .012 and .028 volts (12 to 28 millivolts). If the least significant digits of the display are changing too rapidly to be read, add smoothing by pressing the right arrow key several times. If the bias voltage is not within the stated limits, do not adjust it at this time. The adjustment will be made as part of the Final Detector Linearity and Slope procedure of Paragraph 3-17.
7. This procedure is complete at this point but the 2075 must be taken out of this mode by completing the following steps.
8. Press:

   SPEC FUNC | 37.0 | ENTER
9. Press:

   SPEC FUNC | 39.0 | ENTER
10. Press the **F** key.
11. This concludes the Final Detector Bias Voltage Check.

3-16. FINAL DETECTOR LINEARITY

This procedure measures the linearity of the Final Detector by adding different levels of attenuation to the IF stages of the 2075. At each level, the 2075 measures its own noise figure and the output voltage of the Final Detector. The 2075 must be warmed-up for at least 15 minutes before performing this test.

The following test equipment is required:

Calibrated Noise Source	Eaton 7618E

1. Place the POWER switch in the ON position.
2. Connect the calibrated noise source to the RF INPUT.

3. Tune the 2075 to 30 MHz either by pressing the **UP ARROW** key or by pressing **30 ENTER**. Window A will display 30 MHz when the instrument is tuned to this frequency.

4. Press the **F** key. This places the 2075 in the noise figure only (uncorrected measurements) mode.

5. Press the **RIGHT ARROW** key four or five times to add smoothing and slow the random changes of the least significant digits of the noise figure value which is displayed in Window C.

6. Record the noise figure value displayed in Window C. This value should be approximately 5 to 6 dB.

7. Press:

   SPEC FUNC   20.2   ENTER

8. The value now displayed in Window A is the output voltage of the Final Detector. Verify that this value is less than 4.98 volts. Window B displays a 0, indicating that no attenuation is being applied in the RF stage. Window C displays some value which is the amount of attenuation being applied to the IF stage (5 or 10 dB).

9. Press:

   SPEC FUNC   38.3   ENTER

   This will place 10dB of attenuation in the IF stage. Window C displays a 10.

10. Verify that the detector voltage displayed in Window A is less than 4.98 volts.

11. Press the **ON/OFF** key. The green NOISE DRIVE indicator will go out.

12. Verify that the voltage now displayed in Window A is greater than .20 volts.

13. Press the **F** key. This returns the 2075 to the noise figure measurement mode. The green NOISE DRIVE indicator will begin to blink.

14. Record the noise figure value now displayed in Window C. This value should be virtually equal to the value recorded in step 6 (within ± .03 dB).

15. Press:

    SPEC FUNC   38.4   ENTER

    This places 15 dB of attenuation in the IF stage. Window C will display 15 dB.

16. Verify that the detector output voltage displayed in Window A is less than 4.98 volts.

17. Press the **ON/OFF** key. This turns off the noise drive voltage and causes the green NOISE DRIVE indicator to go off.

18. Verify that the detector output voltage displayed in Window A is greater than .20 volts.

19. Press the **F** key. This returns the 2075 to the noise figure measurement mode.

20. Record the noise figure value now displayed in Window C. This value should be virtually the same as those recorded in steps 6 and 14.

21. Press:

    SPEC FUNC   38.5   ENTER

    This will place 20 dB of attenuation in the IF stage. Window C will display 20 dB.

22. Verify that the detector output voltage displayed in Window A is less than 4.98 volts.

23. Press the **ON/OFF** key. This turns off the noise drive voltage.

24. Verify that the detector output voltage displayed in Window A is approximately .20 volts. For this step, the voltage may have gone below .20 volts due to the low level of input to the Final Detector.

25. Press the **F** key.

26. Record the noise figure value displayed in Window C. This value should be virtually equal to the values recorded in steps 6, 14 and 20. However, if the detector output voltage seen in Step 24 was less than .20 volts, then the noise figure value now displayed in Window C may vary from the earlier readings by more than .03 dB.

27. Press:

    SPEC FUNC | 38.0 | ENTER

    This returns the 2075 to its attenuation autoranging mode.

28. This concludes the Final Detector Linearity Test.

3-17. FINAL DETECTOR LINEARITY AND SLOPE

This procedure is performed to verify the linearity and the slope of the Final Detector. If the procedure of Paragraph 3-15 showed the Final Detector Bias to be between 12 and 28 millivolts, and the procedure of Paragraph 3-16 was successfully completed, then the following procedure may be omitted.

This procedure is difficult to perform because the measurement is greatly effected by test equipment drift. However, accurate measurements can be obtained if the measurements are done quickly. Test cables should be short and well shielded because the measurements can be effected by RF picked up from the environment. Also, use the minimum possible number of adapters in the test setup.

This procedure need not be performed if the procedures of Paragraphs 3-15 and 3-16 have been successfully completed.

The following test equipment is required:

	Signal Generator	HP 8656A
(2)	10 dB Step Attenuator	HP 355D
	1 dB Step Attenuator	HP 355C
	30 dB Fixed Attenuator	HP 8491 with option 030
	Power Splitter	HP 11652-6009
	Power Detector	HP 8484A
	Power Meter	HP 436A
	Digital Voltmeter 5 1/2 Digits	Fluke 8840A

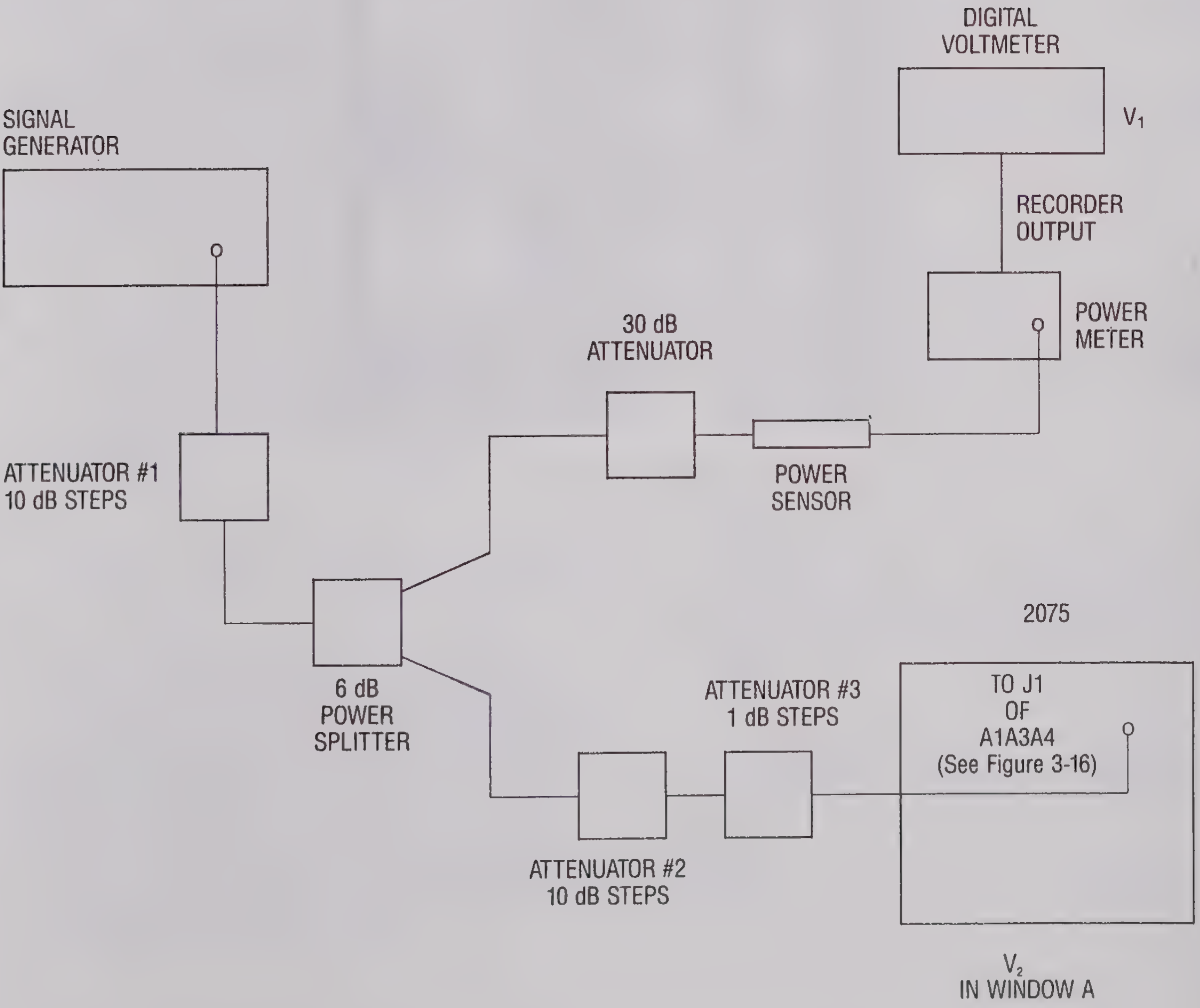

DIGITAL VOLTMETER
V1
SIGNAL GENERATOR
RECORDER OUTPUT
POWER METER
30 dB ATTENUATOR
POWER SENSOR
ATTENUATOR #1 10 dB STEPS
2075
6 dB POWER SPLITTER
ATTENUATOR #3 1 dB STEPS
TO J1 OF A1A3A4 (See Figure 3-16)
ATTENUATOR #2 10 dB STEPS
V2 IN WINDOW A

Figure 3-15. FINAL DETECTOR LINEARITY AND SLOPE SETUP

1. Remove all 3 top covers from the 2075.
2. Apply AC power to the 2075 and allow 30 minutes for the instrument to warm up.
3. Disable the FCAL function by pressing:

SPEC FUNC 15.2 ENTER

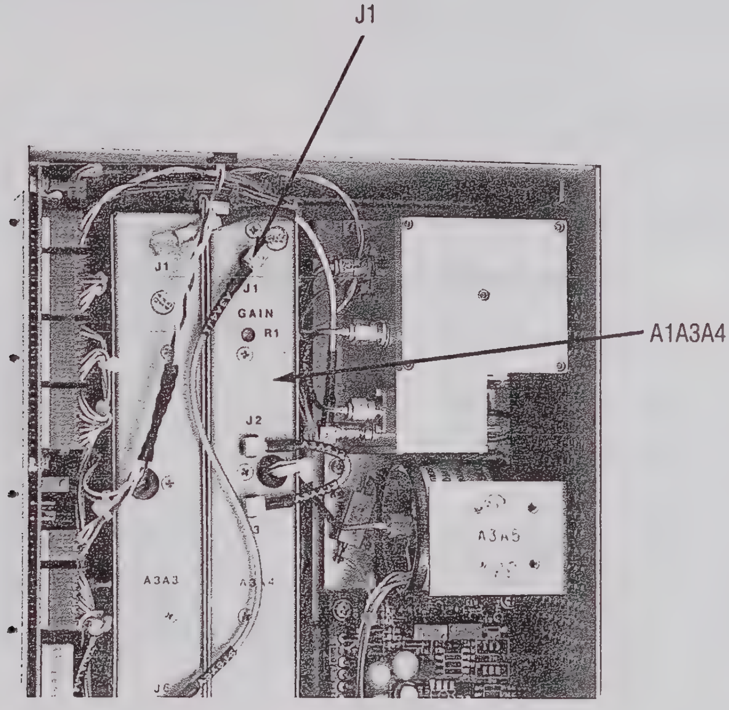


Figure 3-16. LOCATION OF J1 OF A1A3A4

4. Disconnect the internal cable from connector J1 of Assembly A1A3A4. See Figure 3-16 for the location of J1.
5. Press:

SPEC FUNC 38.4 ENTER

This will cause the 2075 to place 15 dB of attenuation in the IF stage on Assembly A1A3A4.

6. Press:

SPEC FUNC 20.1 ENTER

This places the 2075 in a voltmeter mode, causing the bias voltage on the Final Detector to be displayed in Window A. (When no signal is applied to the RF input, the Final Detector bias is displayed. When some signal is applied to the RF input, the Final Detector output voltage is displayed.)

7. Add smoothing by pressing the **RIGHT ARROW** key until 8 light bars are lit in the smoothing indicator.

8. Verify that the voltage displayed in Window A is between .012 and .028 (12 to 28 millivolts). If the voltage is not within this range, do not adjust it yet. The adjustment will be performed, if necessary, at the end of this procedure.

9. Set up the test equipment as shown in Figure 3-15 and allow it to warm up for at least 30 minutes.

11. Set the signal generator controls to obtain a CW output of 30 MHz.

12. Adjust the signal generator output level and also Attenuator 1 to obtain a reading of −29.5 dBm ± .2 dB on the power meter. If the power meter has an analog display, the needle should be almost at full scale deflection. If the power meter has a digital display, its range hold function should be used to prevent a range change.

NOTE

It is critical that the power meter does not change range during this measurement. If it does, the power level should be readjusted and the procedure repeated.

13. Adjust the settings of Attenuators 2 and 3 to obtain a reading in Window A of just below 4.984 volts.

14. Record the voltage indicated by the DVM (V1 high) and record the voltage displayed in Window A of the 2075 (V2 high). These voltages should be recorded in a table, similar to Table 3-5 on page 3-29.

15. Increase the attenuation of Attenuator 1 by 10 dB. Record the voltage indicated by the DVM (V1 low) and record the voltage displayed in Window A of the 2075 (V2 low).

16. Remove the 10 dB of attenuation that was added in Step 15.

17. Increase the combined attenuation of Attenuators 2 and 3 by 1 dB.

18. Repeat steps 14, 15, 16 and 17, recording the displayed voltages, until V2 low goes below .20 volts. The idea here is to add attenuation in 1 dB steps, and record the high values of V1 and V2. Then, for each 1 dB step, momentarily add 10 dB of attenuation, and record the low values of V1 and V2.

19. After all the voltages are recorded in the table, calculate the error for each 1 dB step, using the equation:

$$\text{Error (dB)} = 20 \log \frac{\text{V2 high}}{\text{V2 low}} - 10 \log \frac{\text{V1 high}}{\text{V1 low}}$$

20. Record the error for each step in the table.

21. If the error is greater than ± .03 dB for one or more steps in the range where V2 high is from 5.0 volts down to .55 volts, then the Final Detector bias should be adjusted. If the error is within the stated limits, then this concludes the procedure. Allowable error limits are shown in Table 3-6 on page 3-30.

22. To adjust the bias, go back to the beginning of this procedure and perform steps 1 through 8. Then adjust resistor R40 on assembly A1A3A4 to change the value displayed in Window A by 2 millivolts. However, after adjustment, the displayed voltage must still be between 12 and 28 millivolts. See Figure 3-17 for the location of R40.

    Then repeat Steps 9 through 21 of this procedure until the error is within the stated limits of Step 21.

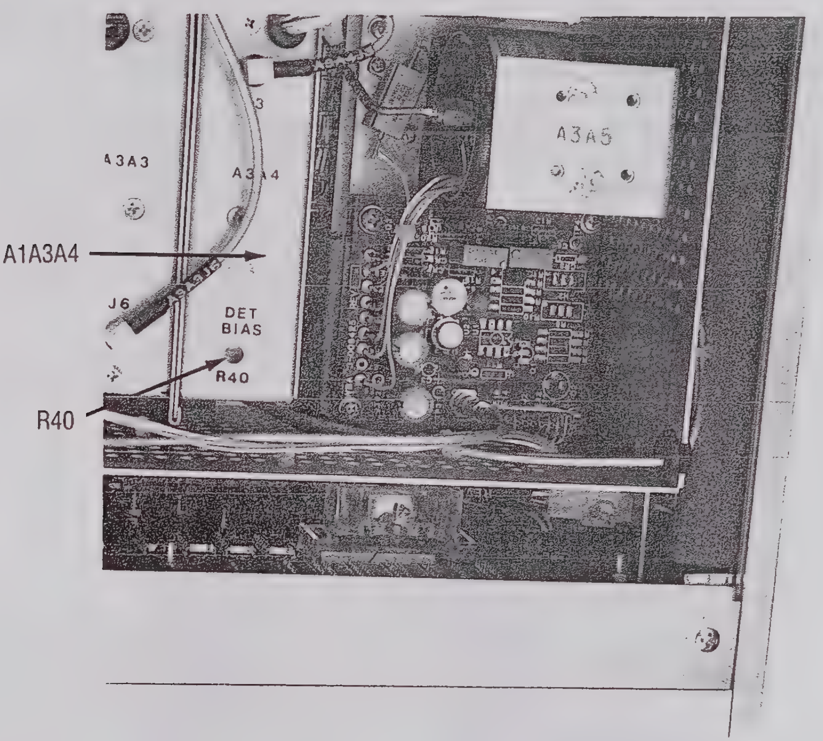
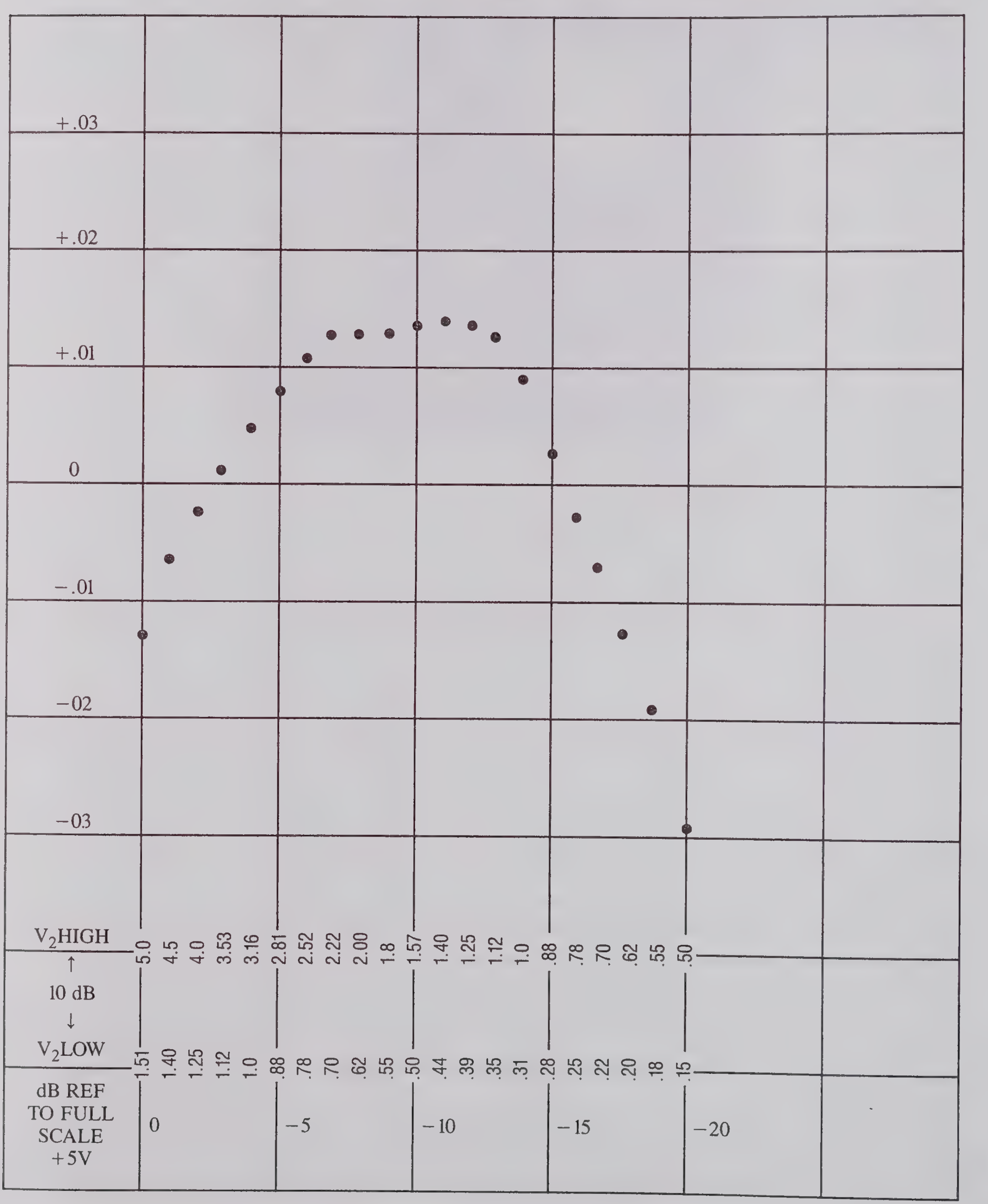

A3A5
A3A3
A3A4
A1A3A4
J6
DET
BIAS
R40
R40

Figure 3-17. LOCATION OF R40 OF A1A3A4

Table 3-5. RECORDED VALUES FOR V1 AND V2

COMBINED SETTING OF ATTEN. 1 AND 2	V1 HIGH	V2 HIGH	V1 LOW	V2 LOW	ERROR

Table 3-6. 2075 FINAL DETECTOR
TYPICAL ERROR FOR A 10 dB CHANGE



3-18. IF ATTENUATORS CALIBRATION

In this procedure the 2075 automatically places different levels of attenuation in its IF stage. Each IF attenuator is measured and the values are stored internally.

No test equipment is required for this procedure.

1. Place the POWER switch in the ON position.
2. Remove any devices connected to the RF INPUT.
3. Press:

   SPEC FUNC | 19.1 | ENTER

4. Verify that the message CAL0 appears in Window B and that the letters, IF, appear in Window C.
5. Verify that the words CAL1, CAL2, CAL3, and CAL4 appear successively in Window B while the unit continues to calibrate each IF attenuator.
6. When a frequency value appears in Window A, and some numeric value may begin flashing in Window C, this procedure is successfully completed.

3-19. OVERALL GAIN ADJUSTMENT

This procedure is performed to find the frequency at which the 2075 has the highest gain. Then the gain at this frequency is adjusted. This adjustment insures that the 2075 will successfully perform Second Stage Calibrations using a variety of noise sources with different ENR values under all temperature conditions.

Test equipment required:

Calibrated Noise Source with ENR values of 15 to 16 dB from 10 to 1900 MHz	Eaton 7618E

1. Apply AC power to the 2075. Press the **PRESET** key.
2. Press:

   SPEC FUNC | 5.1 | ENTER

   This selects ENR Table 1.

3. Press **ENR**. This places the 2075 in the mode which allows viewing of noise source calibration data (ENR values) stored in the ENR tables.
4. Use the up arrow and down arrow keys to examine and verify that ENR data is currently stored in the table.
5. If no frequencies and ENR values are stored in the table, use the procedure of paragraph 3-20, steps 1 through 13, to enter the data, and then return to this procedure. ENR data should be entered for frequencies up to 1900 MHz.
6. Connect the calibrated noise source to the RF INPUT and NOISE DRIVE connectors.
7. Press **CALIB**. The 2075 will begin the Second Stage Calibration Procedure.
8. Allow the 2075 to proceed through the CAL1 step of the calibration procedure. As soon as the message CAL2 is displayed in Window B, press the **CALIB** key to stop the procedure.
9. Press:

   SPEC FUNC | 35.1 | ENTER

   The 2075 will perform a search to find the frequency point having the highest gain. When the search is completed, this frequency and the corresponding detector output voltage are displayed in Windows A and B respectively. Record the frequency.

10. The search just performed was done across the band from 10 MHz to 1900 MHz using 20 MHz frequency steps (the default value). Therefore, the frequency displayed was accurate only to a resolution of 20 MHz. The next few steps are performed to find this frequency of highest gain to a resolution of 2 MHz by doing another search over a narrow frequency band, 180 MHz wide.

11. Determine what frequency is the last multiple of 100 MHz below the frequency recorded in step 9. This will be the new start frequency. (If step 9 gives a frequency less than 100 MHz, then enter 10 MHz in Step 12.)

    EXAMPLE: If the frequency recorded in step 9 was 1660 MHz, the new start frequency is 1600 MHz.

12. Enter the new start frequency by pressing:

    Ex.

    START FREQ
    1600
    ENTER

13. Determine what frequency is 180 MHz above the frequency entered in step 12. This will be the new stop frequency.

    EXAMPLE: If the frequency entered in step 12 was 1600 MHz, the new stop frequency is 1780 MHz.

14. Enter the new stop frequency by pressing:

    Ex.

    STOP FREQ
    1780
    ENTER

15. Enter a frequency step size of 2 MHz by pressing:

    STEP SIZE
    2
    ENTER

16. Press the **CALIB** key. The 2075 will perform another Second Stage Calibration beginning with CAL0. As soon as CAL1 is completed, press the **CALIB** key again.

17. Press:

    SPEC FUNC
    35.1
    ENTER

    The frequency having the highest gain is displayed in Window A. This approximates the frequency from step 9, but to a resolution of 2 MHz. Record the frequency in the display and enter it as the fixed frequency in the next step.

    EXAMPLE: Displayed frequency is 1652 MHz and is entered in the next step.

18. Press: 18

    Ex.

    FIXED FREQ
    1652
    ENTER

    This tunes the oscillator to the frequency being entered.

19. Press:

    SPEC FUNC
    38 3
    ENTER

    This will add 10 dB of IF attenuation and place the 2075 in a voltmeter mode. A voltage value is displayed in Window A. This is the "noise on" voltage from the Final Detector.

20. Add some smoothing until 4 or 5 light bars are lit in the smoothing indicator. Then adjust resistor R1 on assembly A1A3A4 to obtain a reading in Window A of 3.0 volts, ± .01 volts. This sets the IF gain of the 2075. See Figure 3-18 for the location of R1.

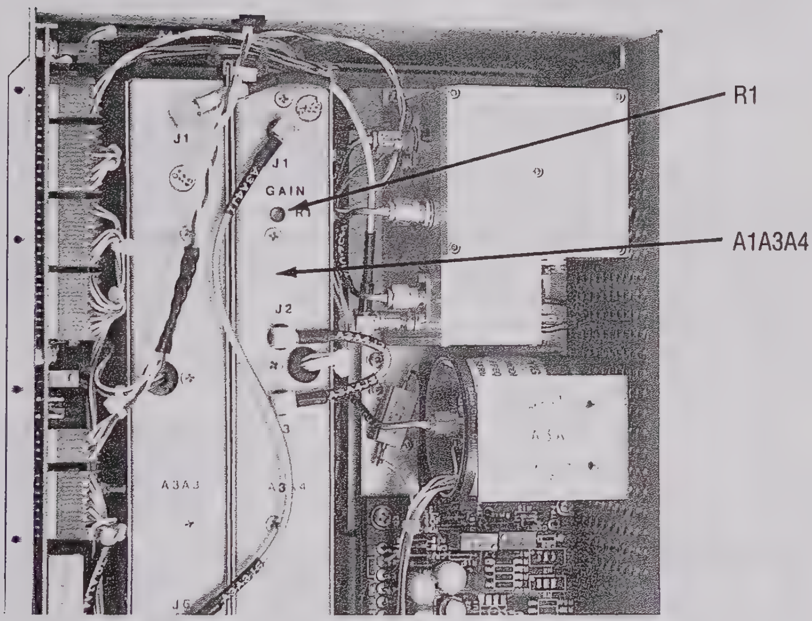


Figure 3-18. LOCATION OF R1 OF A1A3A4

21. Press:

    SPEC FUNC

    38.0

    ENTER

    This places the 2075 into its IF attenuation autoranging mode.

22. This concludes the Overall Gain Adjustment Procedure.

3-20. SECOND STAGE CALIBRATION

In the first part of this procedure frequencies and corresponding noise source ENR values are entered into an ENR table of the 2075 by the operator. Then the 2075 measures its own second stage noise figure at different frequencies and gain levels, and stores these values.

Test equipment required:

Calibrated Noise Source 10 to 1850 MHz	Eaton 7618E

Perform the following steps:

1. Select the noise source which will be used to make the measurements.
2. Apply AC power to the 2075.
3. Allow several seconds for the 2075 to complete its automatic power-up self tests. These are completed when the message FCAL has appeared in, and then disappeared from, Window B.

4. Press the **PRESET** key. Wait until the new FCAL message disappears from Window B, signifying that the frequency calibration is completed. Preset restores the control parameters to a set of known values.

5. Press:

   SPEC FUNC   5.1   ENTER

   This calls up, or activates, Table 1. The data about to be entered will be stored in Table 1 (5.2 would have called up Table 2 and 5.3 would have called up Table 3). The error message 104 may appear indicating that no data is currently stored. If so, it may be disregarded.

6. Press:

   ENR

   This places the 2075 in the mode which allows entry of the frequencies and ENR values. The red light in the center of the ENR key is illuminated. Also, the ENTER annunciator in Window A begins to blink, signifying that the operator is required to enter a frequency.

7. Enter the first calibration frequency, in MHz, from the noise source calibration data sheet (for example, 10 MHz) by pressing:

   10   ENTER

   The frequency just entered appears in Window A. The ENTER annunciator in Window B begins to blink signifying that the operator is required to enter the ENR value, in dB, for the frequency just entered.

8. Read the ENR value for the frequency just entered from the noise source calibration data sheet, or the inscribed label on the calibrated noise source. Enter this value by pressing:

   numeric keys   ENTER

   The value just entered appears in Window B. This completes the entries for the first frequency. The ENTER annunciator in Window A begins to blink, indicating that the next frequency should be entered.

9. Enter the next frequency, in MHz, from the noise source calibration data sheet by pressing:

   numeric keys   ENTER

   The frequency just entered appears in Window A. The ENTER annunciator in Window B begins to blink, signifying that the ENR value for that frequency should now be entered. ENR values are always entered in decibels.

10. Enter the ENR value by pressing:

    numeric keys   ENTER

    The value just entered appears in Window B. Now the ENTER annunciator in Window A will start to blink again, indicating that the next frequency should be entered.

11. Continue to enter paired frequency and ENR values for all data points shown on the noise source calibration data sheet.

12. After all the entries have been made, use the **DOWN ARROW** and **UP ARROW** keys to examine the entries for correctness. Step down through the table by pressing or holding **DOWN ARROW**. Step up through the table by pressing or holding **UP ARROW**.

    To clear an erroneous entry, first display it using the up or down arrow keys and then press the **CLEAR** key. Both the frequency and the ENR value will be cleared. Then enter the correct value. The **ENTER** key can be used to toggle the ENTER annunciator back and forth between Window A and Window B. See paragraph 3-31 for more information.

    To clear the entire table, press:

    SHIFT   CLEAR

13. Press:

    ENR

    This takes the 2075 out of the ENR table entry and display mode. The red light in the center of the **ENR** key will go out.

This completes the entry of ENR data. Continue with the following steps to perform the Second Stage Calibration.

14. Connect the noise source to the RF INPUT connector and the NOISE DRIVE connector. Press:

    CALIB

15. The 2075 will now display an FCAL, CAL0, CAL1, CAL2, and CAL3 as it performs these steps of the calibration process.
16. During the CAL1, while the unit takes 20 MHz steps, verify that the noise figure displayed in Window C is less than 7.0 dB +.001 dB/MHz from 10 MHz to 1850 MHz. The noise figure at 1850 MHz should be less than 8.85 dB. As the 2075 steps up to 1900 MHz, the noise figure may go above 8.85 dB.
17. During the CAL2, while the 2075 takes 20 MHz steps across the frequency band, verify that the noise figure displayed in Window C is less than 13.0 dB from 10 MHz to 1850 MHz.
18. During the CAL3, while the unit takes frequency steps across the band, verify that the noise figure displayed in Window C is less than 28.0 dB from 10 MHz to 1850 MHz.
19. After the 2075 has completed the CAL3, it will return to the start frequency and display values for corrected noise figure and gain. Since nothing has been inserted between the calibrated noise source and the RF INPUT, these values should be 0, with slight random variations.

This concludes the Second Stage Calibration Procedure.

3-21. RF OVERLOAD DETECTOR

This procedure is performed to verify that the RF Overload Detector is properly adjusted to bring in the next stage of RF attenuation to prevent the RF Amplifier (A1A3A1) and the First Mixer from being overloaded.

The following test equipment is required for this procedure:

Calibrated Noise Source 1850 MHz	Eaton 7615, 7616 7618E or 7626
(2) Amplifiers, 20 dB gain at 1850 MHz	Mini Circuits ZFL-2000
(1) Amplifier, 30 dB gain at 1850 MHz	Mini-Circuits ZHL-42
(3) 3 dB Fixed Attenuators	Midwest Microwave 238-3dB
Stepped Attenuator with 10 dB steps	HP 8495A
Stepped Attenuator with 1 dB steps	HP 8494A

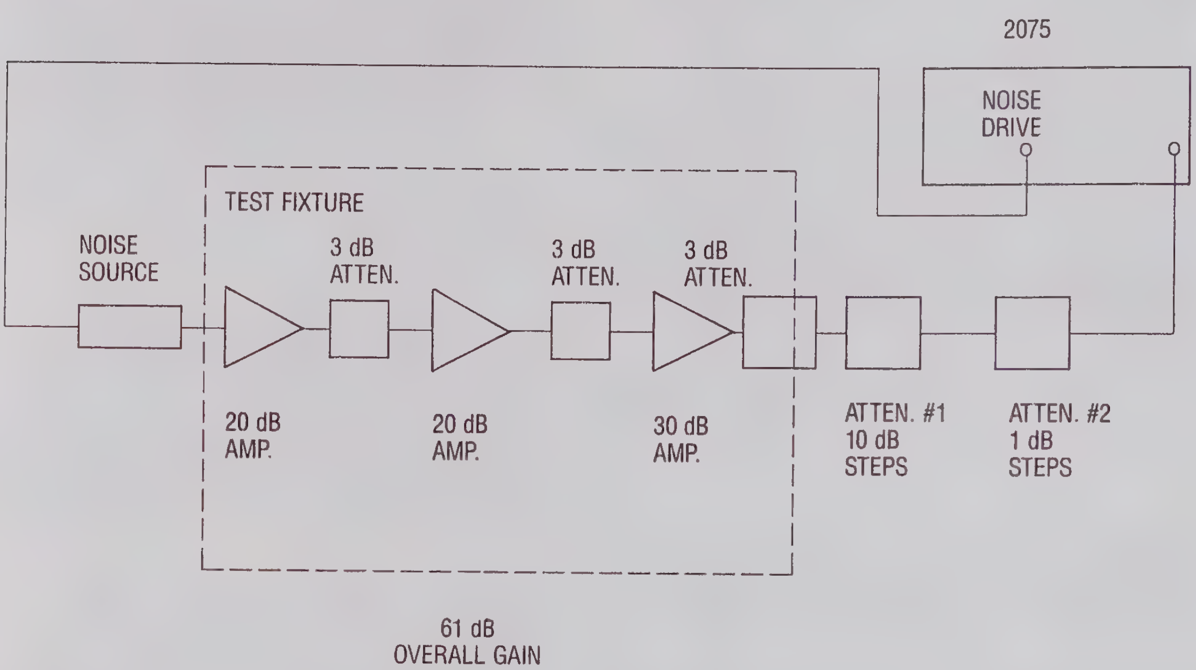

2075
NOISE DRIVE
TEST FIXTURE
NOISE SOURCE
3 dB ATTEN.
3 dB ATTEN.
3 dB ATTEN.
20 dB AMP.
20 dB AMP.
30 dB AMP.
ATTEN. #1 10 dB STEPS
ATTEN. #2 1 dB STEPS
61 dB OVERALL GAIN

Figure 3-19. RF OVERLOAD DETECTOR SETUP

1. Remove all 3 top covers from the 2075 using the procedure in paragraph 3-2. Also remove the bottom cover panel.
2. Place the 2075 on its left side to allow access to the bottom of the unit.
3. Apply AC power to the 2075.
4. Verify that the noise source calibration data has been entered into the ENR table of the 2075. If necessary use Steps 1 through 13 of paragraph 3-20 to enter the frequency and ENR values.
5. Connect the noise source to the 2075.
6. Add some smoothing until 5 light bars are lit in the smoothing indicator and then tune the 2075 to 1800 MHz by pressing:

   FIXED FREQ   1800   ENTER

7. Perform a fixed frequency Second Stage Calibration by pressing:

   SHIFT   CALIB

8. Insert the amplifiers and attenuators into the setup as shown in Figure 3-19.
9. Set the combined value of the attenuators to give 45 dB of attenuation.
10. Gradually decrease the attenuation in 1 dB steps while observing the gain reading in Window B of the 2075. After each 1 dB decrease in attenuation, press the **F + G** key to obtain a gain and noise figure measurement. Record these values at each 1 dB step. For each 1 dB decrease in attenuation, the gain displayed in Window B will increase by 1 dB.

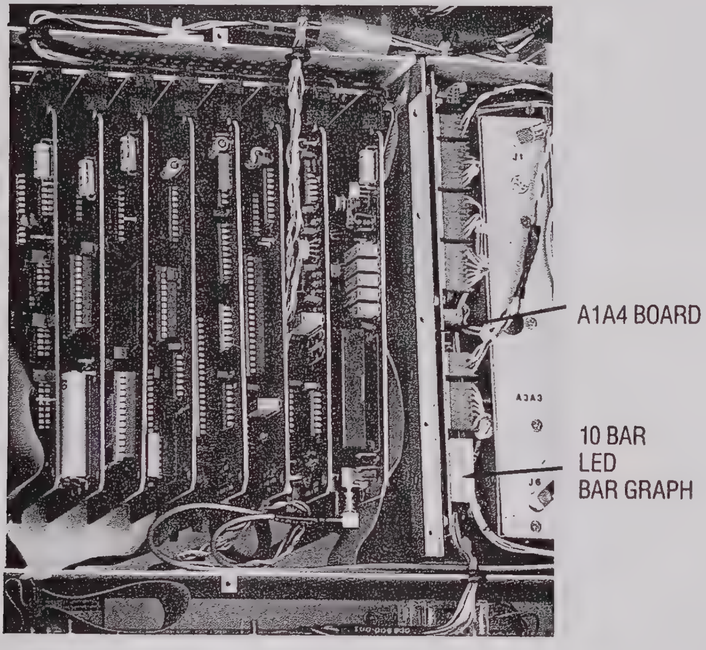


Figure 3-20. LOCATION OF BAR GRAPH OF A1A4

11. Locate the 10 bar LED bar graph on the top front edge of the Interconnect Board. See Figure 3-20. When the gain value in Window B reaches approximately 36 to 40 dB, the third light bar from the front should light.
12. If the third light bar lights within this gain range, then the RF Overload detector needs no adjustment.

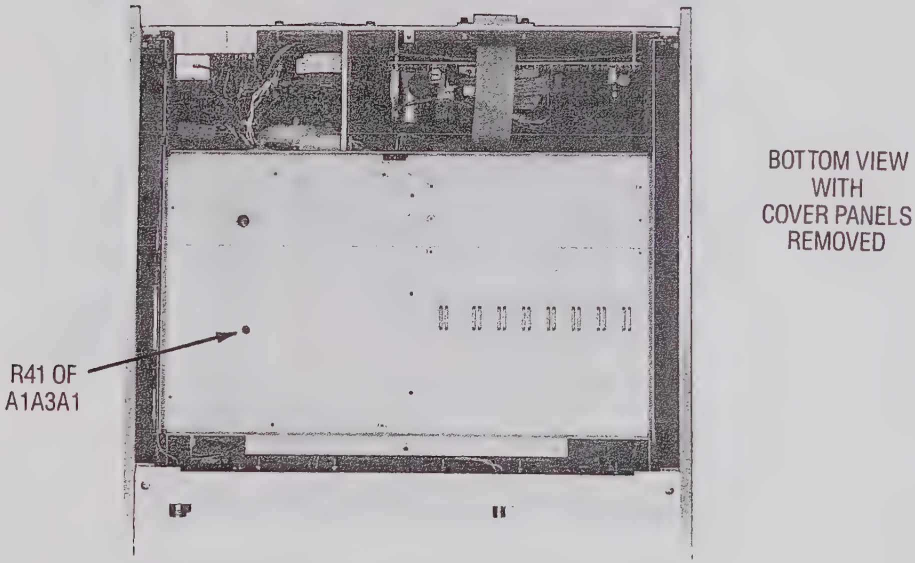


Figure 3-21. LOCATION OF R41 OF A1A3A1

13. If the light bar does not light when the gain is between 36 and 40 dB, set the attenuators to obtain a gain of 38 dB as shown in Window B. Then, slowly adjust resistor R41 on the RF Amplifier Assembly A1A3A1 until the third light bar lights. The location of R41 is shown in Figure 3-21.

14. Verify that the noise figure value in Window C is within ± .04 dB of the noise figure value that was recorded for the 1 dB step which gave 22 dB of external gain.

15. This concludes the procedure.

3-22. GAIN MEASUREMENT RANGE, LINEARITY AND ACCURACY

This procedure is performed to verify the linearity of 2075 gain measurements for external gains from 20 to 50 dB. It also verifies the capability of the 2075 to measure external gains as high as 50 dB. (For an external gain of 50 dB from an amplifier with 2 GHz of bandwidth, and using a noise source with 16 dB ENR, the input power to the 2075 is approximately −12 dBm.) Optional steps at the end of this procedure can be performed to verify the accuracy of gain measurements performed by the 2075.

The following test equipment is required:

Calibrated Noise Source 1850 MHz	Eaton 7615, 7616 7618E or 7626
(2) Amplifiers, 20 dB gain from 10 to 2000 MHz	Mini Circuits ZFL-2000
Amplifier, 30 dB gain from 700 to 4000 MHz	Mini Circuits ZHL-42
(3) 3 dB Fixed Attenuators	Midwest Microwave 238-3dB
Stepped Attenuator with 10 dB steps	HP 8495A
Stepped Attenuator with 1 dB steps	HP 8494A

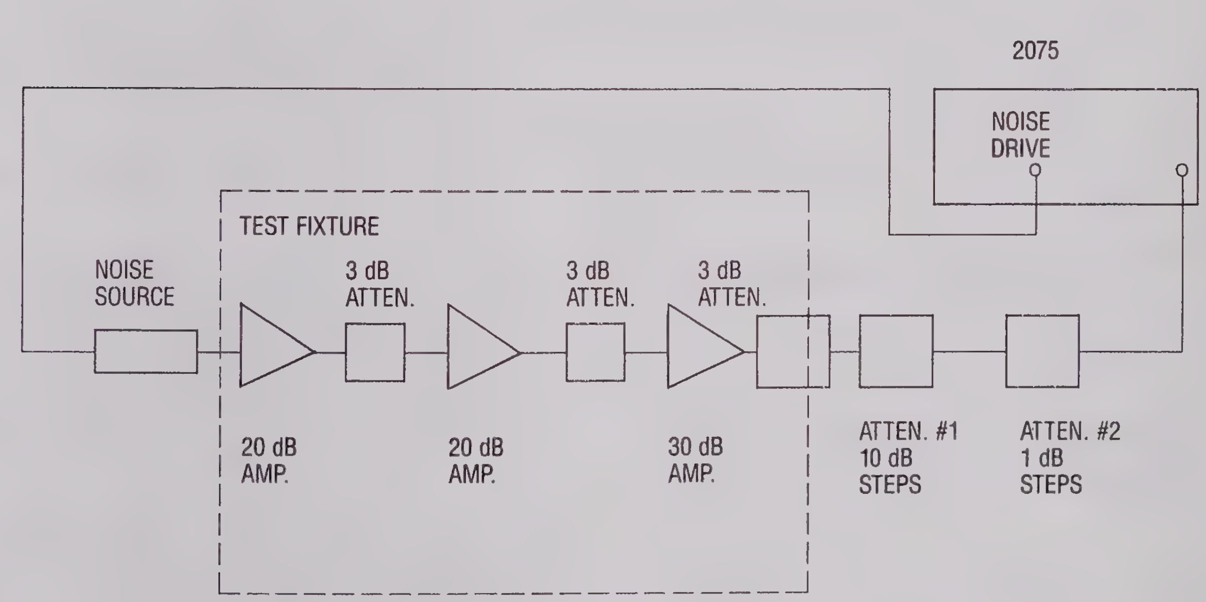

2075
NOISE DRIVE
TEST FIXTURE
NOISE SOURCE
3 dB ATTEN.
3 dB ATTEN.
3 dB ATTEN.
20 dB AMP.
20 dB AMP.
30 dB AMP.
ATTEN. #1 10 dB STEPS
ATTEN. #2 1 dB STEPS

Figure 3-22. GAIN MEASUREMENT RANGE AND LINEARITY SETUP

1. Connect the calibrated noise source to the 2075.
2. Apply AC power to the 2075 and allow 30 minutes for the instrument to warm up.
3. Verify that the calibration data for the noise source has been entered into the ENR table of the 2075. If necessary perform Steps 1-13 of paragraph 3-20 to enter the data.
4. Connect the noise source to the RF INPUT of the 2075.
5. Press the **RIGHT ARROW** key several times until 7 light bars are lit in the smoothing indicator.
6. Tune the 2075 to 1800 MHz by pressing:

   FIXED FREQ | 1800 | ENTER

7. Perform a fixed frequency Second Stage Calibration at 1850 MHz by pressing:

   SHIFT | CALIB

8. Insert the amplifiers and attenuators between the noise source and the 2075 as shown in Figure 3-22.
9. Set Attenuators 1 and 2 to give a combined attenuation of 45 dB.
10. Gradually decrease the setting of Attenuators 1 and 2, in 1 dB steps, until a gain value of approximately 22 dB is displayed in Window B of the 2075. Record the actual gain value from Window B and the noise figure value from Window C.
11. Continue to decrease the combined attenuation of Attenuators 1 and 2 in 1 dB steps. After setting each step, press the **ENTER** key on the 2075 front panel. This causes the smoothing to begin a new averaging sequence for each step. Allow sufficient time for the readings to settle before recording the gain and noise figure values in Windows B and C.
12. Repeat step 11 until the gain displayed in Window B is approximately 50 dB.
13. Verify that the recorded gain values show a change of 1 dB for each 11 dB change of attenuation.
14. Verify that the recorded noise figure value at 50 dB of external gain is within ± .04 dB of the value recorded in Step 10 at approximately 22 dB.
15. This completes the gain range and linearity verification.

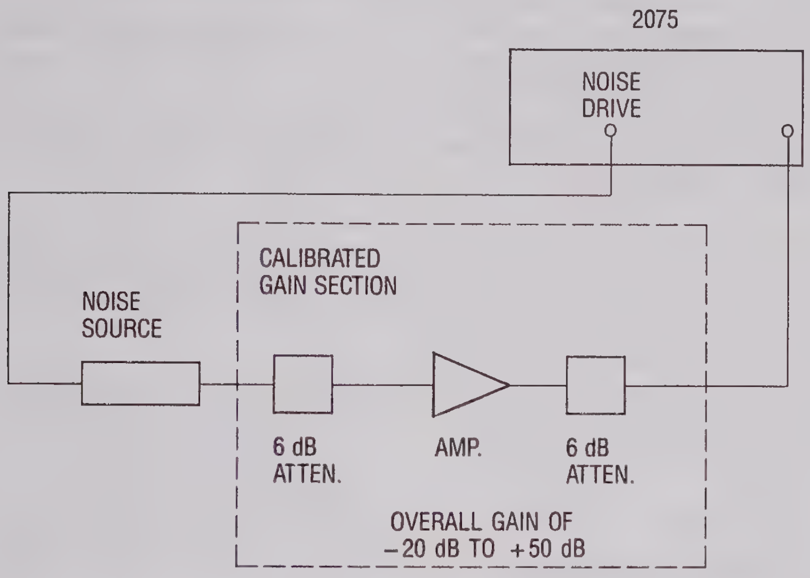


Figure 3-23. GAIN ACCURACY SETUP

The following steps are performed to verify that the gain measurements performed by the 2075 are accurate within ± .2 dB. This procedure is difficult to make, and may be performed at the option of the user. It requires a calibrated gain section consisting of two 6 dB attenuators and an amplifier with very good gain stability, flatness, and low VSWR. The net gain of the gain section should be between −20 dB and +50 dB.

This gain section must be calibrated at one or more CW frequencies near the center of the band from 10 MHz to 1850 MHz. It is recommended that the user calibrate the gain section using an automatic network analyzer. If an ANA is not available, the gain section can be calibrated using a frequency generator and a power meter. Because the following procedure compares the 2075 gain accuracy against the calibrated gain section, the actual gain of the calibrated gain section should be known to an accuracy better than ± .1 dB.

The frequencies at which the gain section has been calibrated, will be used in the following steps:

1. Apply AC power to the 2075 and allow at least 30 minutes for the instrument to warm up.
2. Connect the calibrated noise source to the 2075. Tune the 2075 to a frequency for which the gain of the calibrated gain section is known by pressing:

   SPEC FUNC 5.1 ENTER

3. Perform a fixed frequency Second Stage Calibration by pressing:

   SHIFT CALIB

4. Connect the calibrated gain section to the 2075 as shown in Figure 3-23.

5. Press the **F + G** key to measure the Noise Figure and gain of the calibrated gain section. Verify that the gain value displayed in Window B of the 2075 is within ± .2 dB of the known gain of the calibrated section. (This assumes that the calibrated gain section is accurate to less than ± .1 dB of its known value.)

6. Repeat steps 2 through 5 for any additional frequencies at which the gain of the calibrated gain section is known.

7. This concludes the procedure.

SECTION 4

THEORY OF OPERATION

4-1. INTRODUCTION

This section contains information on the theory and principles of operation of the 2075 Noise-Gain Analyzer.

The information in this section is presented in three different levels of detail. The first level is an overall description based on the Overall Block Diagram of Figure 7-1.

The second level consists of three parts: a functional description of the RF section based on the RF Block Diagram of Figure 7-2, a functional description of the digital section which is based on the Digital Block Diagram of Figure 7-3, and a functional description of the keyboard and display section, based on the block diagram of Figure 7-4.

The third level of detail consists of circuit descriptions for each assembly. These are supported by the circuit schematics of Figures 7-11 through 7-27.

4-2. DESCRIPTION BASED ON OVERALL BLOCK DIAGRAM

Refer to the Overall Block Diagram of Figure 7-1.

The 2075 is a programmable, microprocessor-controlled instrument designed specifically to make precise measurements of noise and gain characteristics of RF devices. Its circuitry is functionally divided into three main sections, the RF Section, the Digital Section, and the Keyboard and Display Section. The top half of Figure 7-1 shows the RF assemblies. These form a double conversion receiver which measures noise power in a 5 MHz bandwidth. The RF assemblies are:

1900 MHz Lowpass Filter	A1FL1
RF Amplifier	A1A3A1
Second Converter	A1A3A2
First 30 MHz IF Preamplifier	A1A3A3
Second 30 MHz IF Detector	A1A3A4
YIG Local Oscillator and Driver	A1A3A5

The bottom half of Figure 7-1 shows the digital assemblies which execute all the control functions in the 2075. Each assembly is a separate digital printed circuit card which plugs into the Motherboard, or Microprocessor Bus. This is a standard bus (STD BUS) digital system, by which all digital assemblies communicate with the CPU and each other. The assemblies in this section are:

Front Panel Interface and APU	A1A2A1
RAM and Battery Backup RAM	A1A2A2
Microprocessor	A1A2A3
ROM	A1A2A4
GPIB I/O	A1A2A5
Direct Memory Access Controller and Display RAM	A1A2A6
Scope Driver	A1A2A7
Analog/Digital I/O	A1A2A8
Motherboard	A1A2A9

The bottom left side of Figure 7-1 shows the third section which is formed by the keyboard and display assemblies. These are:

Keyboard	A1A1A1
Displays and Meters	A1A1A2

An interface between the RF and digital sections is provided by the Interconnect Board (assembly A1A4) and the Analog to Digital I/O Board (assembly A1A2A8). These are located in the approximate center of the Overall Block Diagram. The Interconnect Board serves as the analog side of the Digital to RF interface. It distributes gain control signals to the RF section. It also applies the Noise Source Drive Voltage and the Relay Power Voltage to their respective front and rear panel connectors. Additionally, the Interconnect Board distributes DC voltages from the DC Power Supply to the RF assemblies.

The Analog/Digital I/O Board A1A2A8 is the second part of the interface between the digital and RF sections. This board converts analog signals to digital form and also converts digital signals to analog. It also sends and receives TTL signals to and from the Interconnect Board.

The Motherboard Assembly A1A2A9 appears on the block diagram as the Microprocessor Bus. Digital assemblies, A1A2A1 through A1A2A8, plug into this board, as it provides the intercommunications link between the CPU and the other digital assemblies.

The DC Power Supply provides four DC voltages to the 2075 circuitry. These are +30, +15, −5, and +5 volts. One DC bus carries these four potentials to the Interconnect Board for distribution to the RF assemblies. Another DC bus carries three of these potentials, +15, −15, and +5 volts, to the Motherboard (Microprocessor Bus) for distribution to the digital circuits. Refer to the DC Power Distribution diagram of Figure 7-6.

4-3. FUNCTIONAL DESCRIPTION OF RF SECTION

Refer to the RF Block Diagram of Figure 7-2.

RF Input

The input frequency range of the 2075 extends from 10 MHz to 1900 MHz. The actual RF input consists of broadband noise in the frequency range from 10 MHz up to the maximum frequency of the noise source in use. This broadband noise is generated by either a solid state noise source, a true hot/cold thermal noise source, or a gas discharge noise source.

The noise input may exist across the entire band from 10 to 1900 MHz, as occurs when only the noise source is connected to the RF input. This is the situation when a Second Stage Calibration is being performed.

Alternately, the noise input may cover only a relatively narrow section of the band from 10 to 1900 MHz. This latter condition exists when the Device Under Test is connnected between the noise source and the RF input. In such a case, the DUT may act like a filter, rejecting those noise components which lie outside its own operating band.

In either case the broadband or narrowband noise is input through the RF INPUT connector on the front panel or the optional RF INPUT connector on the rear panel. This noise signal is then immediately applied to the 1900 MHz Lowpass Filter A1FL1.

1900 MHz Lowpass Filter A1FL1

The noise signal passes through the 1900 MHz lowpass filter, assembly A1FL1. This filter rejects noise in the frequency range above 1900 MHz, which is the effective maximum input frequency of the 2075.

RF Amplifier Assembly A1A3A1

From the output of filter A1FL1, the noise signal goes to the input of the RF Amplifier Assembly, A1A3A1. The functions of this assembly are to sense the input signal level, filter the signal, attenuate or amplify the signal, and then upconvert it to 2200 MHz.

Immediately after entering this assembly, the noise signal goes through a 1900 MHz lowpass filter which provides further rejection of noise above 1900 MHz. The signal then goes through a gain control network consisting of three relays, two attenuators, one amplifier, and an RF Overload Detector.

The attenuators and the amplifier in the network have fixed values. The gain is varied by switching the relays to change the noise signal path. When more gain is desired, the signal is switched through the 25 dB gain amplifier and around the 15 dB attenuators. When less gain is desired, the signal is switched through the attenuators and around the amplifier.

The RF Overload Detector is used to detect the noise signal level. The analog output from the detector goes to the Interconnect Board A1A4 where it is converted to a digital value. This digital value then goes to the Analog to Digital I/O Board A1A2A8 and is placed on the Microprocessor Bus. The value is read by the microprocessor and compared to values stored in ROM. After determining whether the noise signal should be amplified or attenuated, the microprocessor issues the appropriate switching commands. The switching signals go through the Analog/Digital I/O Board A1A2A8, to the Interconnect Board A1A4, and to the respective relays in the RF Amplifier Assembly A1A3A1.

After passing through the gain control network, the noise signal goes through a second 1900 MHz Lowpass filter which provides increased rejection of noise components above 1900 MHz. The filtered signal is then input to the first mixer and upconverted to 2200 MHz. The variable frequency local oscillator signal to the first mixer is supplied by the YIG Local Oscillator and Driver Assembly A1A3A5.

After upconversion, the noise signal exits the RF Amplifier Assembly and is input to the Second Converter Assembly A1A3A2.

YIG Local Oscillator and Driver Assembly A1A3A5

The function of the YIG LO and Driver Assembly is to supply a variable frequency local oscillator signal to the first mixer on the RF Amplifier Assembly. The YIG driver assembly consists of a YIG oscillator and a tuning amplifier. The amplifier receives a tuning voltage from the Tuning Digital to Analog Converters on the Analog/Digital I/O Board A1A2A8. The amplifier output current varies as a function of its input voltage. The output current is applied to the YIG oscillator, causing its frequency to vary across the range from 2210 to 4100 MHz. At any given moment, the YIG oscillator output frequency is 2200 MHz above the desired RF input frequency. Thus, the YIG driver assembly is the primary tuning mechanism by which the 2075 selects a particular input noise frequency band. When the 2075 operates in a swept frequency mode, the output frequency of the YIG oscillator is swept so that its output frequency is a constant 2200 MHz above the desired RF input frequency.

Second Converter Assembly A1A3A2

The functions of the Second Converter Assembly are to filter and then downconvert the 2200 MHz noise signal from the RF Amplifier Assembly to the final IF frequency of 30 MHz.

The 2200 MHz noise signal enters the assembly and is immediately applied to the 2200 MHz bandpass filter. The filter bandwidth is approximately 8 MHz wide. From the output of the filter the signal is applied to the input of the Second Mixer. A fixed frequency, 2170 MHz local oscillator signal is applied to the second input of the mixer. This local oscillator signal is provided by the 2170 MHz local oscillator, also located on the assembly.The output of the Second Mixer is the Final IF frequency of 30 MHz. This signal exits the Second Converter Assembly and is applied to the input of the First 30 MHz IF Preamplifier.

First 30 MHz IF Preamplifier Assembly A1A3A3

The functions of the First 30 MHz IF Preamplifier are to filter and amplify the Final 30 MHz IF noise signal.

The 30 MHz IF input to the assembly is applied to a 30 MHz bandpass filter. The filter bandwidth is approximately 5.5 MHz. From the filter output the signal goes to a fixed amplifier having 22 dB of Gain. The amplified 30 MHz signal is then applied to a second 30 MHz bandpass filter having a bandwidth of 5.5 MHz. From the output of the second filter the signal is applied to three amplifiers in series. The first amplifier has a fixed gain of 12 dB. The second and third amplifiers each have two fixed gain levels, 1 or 16 dB. They can be switched to either gain level by the application of a control voltage from the Interconnect Board A1A4.

The filtered and amplified 30 MHz IF signal exits the assembly and is applied to the input of the Second 30 MHz IF Detector Assembly A1A3A4.

Second 30 MHz IF, Detector Assembly A1A3A4

The functions of this assembly are to filter, amplify, and then detect the 30 MHz IF noise signal. There are two detectors on the assembly.

The 30 MHz input signal is applied to an amplifier which has two gain levels, 6 or 16 dB. The gain is switched from one level to another by the application of a control voltage from the Interconnect Board A1A4.

From the output of the amplifier the signal goes through a 30 MHz bandpass filter having a bandwidth of 8 MHz. The filtered signal is then applied to a second amplifier which also has two levels of fixed gain. The low gain level is 11 dB and the high gain level is 16 dB. The gain level is switched by the application of a control voltage from the Interconnect Board A1A4.

From the output of the amplifier the signal path splits into two. The first branch goes through an attenuator, a 30 MHz bandpass filter, and then to the 30 MHz IF output connector on the rear panel. This connector is provided to allow sampling of the 30 MHz IF signal for test purposes.

The second branch goes through a detector driver to the Final Detector. The detector driver amplifies the noise signal to bring it within the linearity range of the Final Detector. The Final Detector detects the level of the 30 MHz IF noise signal. The output from the detector goes to a 16 bit analog to digital converter on the Analog/Digital I/O Board, Assembly A1A2A8. The digitized detector output is read by the microprocessor and the noise signal level is determined.

It should be noted that the output from the Final Detector is read under two different conditions in order to make a noise measurement. In the first condition, the detector is read while the noise drive voltage is applied to the noise source, thereby providing a broadband noise signal to the 2075 RF Input connector. The detected value is converted to Noise ON Power.In the second condition, the detector is read while no noise drive voltage is applied to the noise source. The detected value is converted to Noise OFF Power. The digital circuitry then performs the appropriate calculations to derive the selected noise measurement value.

Immediately past the input of the Second 30 MHz IF, Detector, the signal path splits off to provide a sample 30 MHz signal. This sample signal goes through a buffer formed by a 20 dB attenuator and a 20 dB amplifier. This buffer provides isolation from the main signal path. From the buffer output the signal passes through a 30 MHz bandpass filter having a bandwidth of 400 kHz. The filtered output signal is then applied to the Fo Tuning Detector during frequency calibration (FCAL).

While the frequency calibration is being performed, the variable frequency YIG local oscillator on assembly A1A3A5 is tuned, in discrete steps, toward 2200 MHz. When the LO reaches 2200 MHz, the output from the Fo Tuning Detector reaches its peak value. As soon as the detector output begins to decrease, the decrease causes the Slope Change/One-Shot Amplifier to fire. This firing notifies the digital circuitry that the YIG local oscillator is correctly tuned, and the tuning process is stopped.

4-4. FUNCTIONAL DESCRIPTION OF DIGITAL SECTION

Refer to the Digital Block Diagram of Figure 7-3.

The digital section is responsible for all user interface, arithmetic and control functions in the 2075. The Microprocessor Assembly A1A2A3 is the Central Processing Unit, with primary controlling intelligence. However, some of the other digital assemblies also contain on-board processors to handle their board specific functions. This distributed processing scheme keeps the CPU from becoming overburdened and thus greatly enhances system speed.

There are 9 separate assemblies in the digital section. Eight of these plug into the Microprocessor Bus, which is the ninth assembly. The Microprocessor Bus is also designated as the Motherboard, assembly A1A2A9. It provides the path for all internal communications between digital assemblies and is the industrial standard STD BUS. This bus should not be confused with the General Purpose Interface Bus which provides a digital communications link between the 2075 and the outside world.

The Analog/Digital I/O Board, A1A2A8, together with the Interconnect Board A1A4, provides the interface between the digital and RF sections of the 2075.

The overall design of the digital section, i.e. 8 separate assemblies which plug into the Microprocessor Bus, greatly facilitates troubleshooting and repair of any digital hardware failure.

Front Panel Interface and APU Assembly A1A2A1

The Front Panel Interface handles data exchanges between the front panel and the CPU. When a key is depressed, the keyboard is scanned by the CPU via this board. The Front Panel Interface receives the data, and then passes it to the CPU via the Microprocessor Bus.

The Front Panel Interface also receives data from the CPU and sends it to the front panel displays. This includes digital data for display in Windows A, B, and C; data for display via LED's and annunciators; as well as data which is output to the analog front panel meters. Data bound for the front panel meters is first converted to analog form by a dual D/A converter on the Front Panel Interface board. This data is scaled to the corresponding upper and lower limits.

The Arithmetic Processor Unit performs all mathematical functons. By performing these functions in the APU, the CPU is unburdened and system speed is greatly increased.

RAM and BBU RAM Assembly A1A2A2

This board contains four 2K sections of RAM for a total of 8K. The first 2K section provides Battery backed-up RAM. The second and third 2K sections are normal RAM and are not backed-up. They provide storage for general system variables. The fourth 2K section is actually an empty socket reserved for an optional ROM chip which can be ordered with a noise source. The chip stores the noise source calibration data which consists of frequencies and ENR values.

Microprocessor Assembly A1A2A3

The Microprocessor is the Central Processing Unit for the 2075 and it is responsible for all digital and RF control functions. The microprocessor receives all its instructions from the 48K X 8 ROM on the ROM Board A1A2A4. It then issues its commands to the other digital assemblies via the Microprocessor Bus.

The Microprocessor Board also contains 4K of RAM for system use.

ROM Assembly A1A2A4

The ROM board contains six 8K x 8 bit ROM chips for a total of 48K bytes of ROM capacity. It contains all instructions for the microprocessor.

GPIB Interface Assembly A1A2A5

This board handles all low level GPIB handshake functions between the 2075 and the outside world. It talks to the CPU via its own internal registers.

The GPIB address of the 2075 is programmable from the front panel and is stored in battery backed-up RAM. In the event of BBU RAM failure, a DIP switch on the GPIB Interface board is used to automatically set the GPIB address.

DMAC and Display RAM Assembly A1A2A6

This assembly contains the Direct Memory Access Controller Chip (DMAC) and the 1K x 8 bit display RAM. After the Device Under Test is measured and the Noise Figure and Gain Data is determined, the CPU scales the data according to the upper and lower limits which have been entered by the user. Then it sends the X and Y scaled data directly to the display RAM.

The CPU then activates the DMAC which sends the data stored in the display RAM to the Scope Display Driver Board, independently of CPU activity.

Scope Display Driver Assembly A1A2A7

This assembly contains a vector generator which translates the X and Y data from the RAM and DMAC Board into a vector position for display on an oscilloscope or an X-Y plotter. It also contains the Z axis drive which is used for retrace blanking and alternate trace dimming on an oscilloscope, or as the pen lift input on a plotter.

Analog/Digital I/O Assembly A1A2A8

The Analog/Digital I/O card is composed of 4 sections. These are the A/D converter, the D/A converter, The TTL input section and the TTL output section.

The A/D converter accepts the output voltage from the Final Detector and converts it to digital data for the CPU.

The D/A converter converts tuning data from the CPU into an analog tuning voltage which is sent to the YIG Local Oscillator and Driver.

The TTL input receives a digitized voltage from the RF Overload Detector via Interconnect Board A1A4. It also receives the Peak-Find Signal from the One-Shot on Assembly A1A3A4 via the Interconnect Board A1A4. During frequency calibration (FCAL) this signal notifies the CPU that the YIG oscillator is tuned to 2200 MHz.

The TTL Output receives gain control codes from the CPU. These then travel via the Interconnect Board A1A4 to the RF assemblies. These are the signals which switch the gain control relays on the RF Amplifier Assembly A1A3A4, and also switch the gain states of the switched gain amplifiers on the other RF assemblies.

The TTL Output also sends the control signals to the Interconnect Board which turn the Noise Drive voltage and Relay Power voltage on and off. All control signals originate from the CPU.

Motherboard Assembly A1A2A9

This Printed circuit board serves as the Microprocessor Bus through which the 8 digital circuit boards communicate. The Motherboard itself contains no active digital components. It consists of an etched board on which 8 PCB edge connectors are mounted. The 8 digital assemblies plug into these edge connectors.

4-5. FUNCTIONAL DESCRIPTION OF KEYBOARD AND DISPLAY SECTION

Refer to the Digital Block Diagram of Figure 7-3 and the Keyboard and Display Section Block Diagram of Figure 7-4.

This section consists of the Display Board, Assembly A1A1A2, and the Keyboard, Assembly A1A1A1. The display board is mounted directly behind the front panel of the 2075. The keyboard is mounted on top of the display board. Connectors J1 of the Keyboard and J1 of the Display Board are connected together by a ribbon cable which also goes to the Front Panel Interface Board. The Interface Board handles all communications between the Keyboard, the Display Board, and the rest of the system.

Keyboard Assembly A1A1A1

All front panel keys are part of the Keyboard assembly. These are used by the operator to enter numeric data and to initiate all 2075 functions.

When a key is pressed at the keyboard, the key-down detector detects the keystroke and generates an interrupt to the CPU. The CPU then scans the key matrix via the row scanner to determine which key has been pressed. The CPU reads the data in the key matrix data buffer and translates it into a key code. The data buffer is a tristate bus driver. It floats the bus when the key matrix is not being accessed.

Display Board Assembly A1A1A2

The Display Board is responsible for all data displayed in Windows A, B, and C on the 2075 front panel. Window A is the Frequency display, Window B is the Gain Display, and Window C is the Noise Figure display. The Display Board contains 13 seven-segment displays which display the alphabetic and numeric characters in the windows. All characters are encoded by software. It also contains 6 LED bar graphs. Each bar graph has 4 light bars and these backlight the annunciators in the windows.

Also located on the Display Board are the two analog front panel meters which display analog data for Gain and Noise Figure. These meters have no numeric scaling values inscribed on their faces because they are scaled according to upper and lower limits entered by the user.

The Address and Data come from the Front Panel Interface board and enter at J1 via the ribbon cable. The address goes to the address decoders which determine which seven segment displays or which annunciators are to receive the data. After the address is decoded, select lines from the decoder enable the appropriate display or annunciator, and the data is strobed into its destination.

The voltage which drives Analog Meters 1 and 2 comes from the Front Panel Interface board via the same ribbon cable.

4-6. DC POWER DISTRIBUTION

For Serial Numbers 101-285

Eaton 2075's with serial numbers 101 through 285 have two DC Power Supplies. One of these power supplies provides +5 volts, +15 volts, and −15 volts and its designation is A1A5PS1. The schematic for this supply is shown in Figure A-4 in the Addendum.

The second DC power supply provides +30 volts. Its designation is A1PS1 and its schematic diagram is shown in Figure A-3 of the Addendum.

To see the power distribution diagram for 2075's with serial numbers 101 through 285 refer to Figure A-2 in the Drawing Addendum.

For Serial Numbers 286 and Up

The later version of the 2075, beginning with serial number 286 and continuing on up, has only one DC power supply. This one supply provides +5 volts, +15 volts, −15 volts, and +30 volts. The designation for this power supply is A1A5PS1 and the schematic diagram is shown in Figure 7-7 or 7-8. It is noted here two different manufacturers have supplied the DC power supplies that are used in 2075's with serial numbers from 286 on up. The power supply manufactured by the Powertec Company is shown in Figure 7-7. The power supply manufactured by the Summit Company is shown in Figure 7-8. It will be necessary to remove the cover panel and examine the power supply to see which one is in your 2075.

The power distribution diagram for 2075's with serial numbers 286 and up is shown in Figure 7-6.

Refer to the power distribution diagram of Figure 7-6.

4-7. CIRCUIT DESCRIPTION OF RF AMPLIFIER ASSEMBLY A1A3A1

Refer to Figure 7-11 for the schematic diagram of the RF Amplifier Assembly.

The RF Amplifier Assembly A1A3A1, is the first input stage of the 2075. The signals from the noise source and the Device Under Test are input to the 2075 through the RF INPUT connector, which goes to J1 of the RF Amplifier Assembly.

Assembly Functions

The main functions of the RF Amplifier Assembly are as follows:

1. Filter the RF input signal from the DUT.
2. Amplify or attenuate the RF input signal depending on its level.
3. Detect the level of the RF signal and provide a DC level to the Interconnect Board Assembly A1A4.
4. Convert the variable frequency RF input of 10 to 1900 MHz to a fixed 2200 MHz IF.

Assembly Circuits

The main circuits in the RF Amplifier Assembly are as follows:

1. Low-pass filters FL1 and FL2
2. 25 dB gain amplifier
3. Attenuator number 1 (15 dB)
   Attenuator number 2 (15 dB)
   A 2 dB attenuator
   A 6.5 dB attenuator
4. Attenuator and amplifier bypass relays K1, K2, K3, and K4
5. Upconverter, mixer CR4
6. The RF overload detector CR2 and amplifier U1

Circuit Operation

Gain Control Network

The RF input signal is applied through the RF INPUT connector J1 which is located on the 2075 front panel. The signal passes through filter FL1, a 1900 MHz, micro-strip, low-pass filter. From the output of FL1 the signal goes to relay K1, the bypass relay for Attenuator Number 1. When relay K1 is energized, the signal goes through 15 dB Attenuator Number 1. When K1 is de-energized, the signal bypasses Attenuator Number 1.

From the output of K1 the signal flows to relay K2. Relays K2 and K3 are the bypass relays for the 25 dB gain amplifier. Both relays are switched in unison. When both are energized, the RF signal bypasses the amplifier.

The 25 dB gain amplifier is 3 stage, broadband, 10 to 1900 MHz amplifier formed by transistors Q1 through Q7 and their associated circuitry. Transistors Q1, Q4 and Q6 are amplifying transistors. Transistors Q2, Q5, and Q7 provide active bias for transistors Q1, Q4 and Q6 respectively. The DC collector voltage on Q1, Q4 and Q6 is 9 volts.

When K2 is de-energized, the RF signal is applied from the input pole of K2, through capacitor C6, to the base of amplifying transistor Q1. Q1 is biased to provide a low input noise figure. Transistors Q4 and Q6 have successively higher collector currents to provide the large signals which can be present at the output of Q6. Transistor Q6 can deliver output power levels greater than 0 dBm with no compression of the RF signal.

Transistor Q3 is used to provide or remove bias voltage to transistor Q1, depending on the state of relays K2 and K3. When K2 and K3 are de-energized, a 5 volt potential is provided through their coils and applied to point B on the schematic. This causes Q3 to turn on and apply Ground to R11. This turns on Q2, which then applies bias voltage to the base of Q1, causing the amplifier circuitry to operate.

When the amplifier is bypassed, K2 and K3 are energized by a ground applied to pin 7 of plug P1. The Ground is also applied to point B and the base of transistor Q3. This turns off Q3, which then turns off Q2, which removes the bias voltage from the base of Q1. Under these conditions the 25 dB amplifier does not operate.

Diode CR1 protects the emitter to base junction of transistor Q1 from being reverse biased in the event that a high level signal is inadvertently applied to the RF INPUT connector on the front panel.

After the RF signal passes through relay K3 it is applied to the input of relay K4, the bypass relay for 15 dB Attenuator Number 2. When K4 is energized, the RF signal goes through the attenuator. When K4 is de-energized, the attenuator is bypassed.

From the output of K4, the RF signal is applied to filter FL2, a 1900 MHz, micro-strip, low-pass filter. From FL2 the signal passes by test point TP1. TP1 is used only for testing the broad band amplifier and it is not connected to the circuit during normal operation. A jumper can be removed from between R43 and FL2, and then soldered between FL2 and TP1 for test purposes. However, this jumper must be replaced in its original position before the 2075 is used to make measurements.

After FL2 the signal goes through a fixed 2 dB attenuator composed of resistors R43, R44, and R45. Then the RF signal passes through coaxial cable W4 and is input to mixer CR4.

Upconverter

A local oscillator signal having a frequency of 2210 to 4100 MHz, is input through connector J2 and goes through a 6.5 dB attenuator composed of resistors R46, R47 and R48. The LO signal is then input to mixer CR4. In CR4, the RF signal is upconverted to 2200 MHz. The 2200 MHz signal is output through connector J3 and goes to J1 of A1A3A2, the Second Mixer Assembly. See Figure 7-12.

RF Overload Detector

As the RF signal passes from relay K3 to K4, it goes through capacitors C16 and C17. On the output side of C16, the signal is sampled and applied to diode CR2, the RF Overload Detector. Diode CR3 provides temperature compensation. Resistors R33 and R38 form a voltage divider to apply a slight bias voltage to diodes CR2 and CR3.

When no RF signal is applied to the RF INPUT connector J1, resistor R37 is used to adjust the output of operational amplifier U1 to 0 volts. When an RF signal is applied and its presence is detected by CR2, resistor R41 is used to adjust the output of operational amplifier U1. This output determines the RF level at which relays K1 and K4 will energize to pass the RF signal through the attenuators. The sequence of energization is K4 and then K1. The output from U1 is applied through pin 8 of Plug 1 to a window comparator located on the Interconnect Board, Assembly A1A4. See Figure 7-27.

4-8. CIRCUIT DESCRIPTION OF SECOND CONVERTER ASSEMBLY A1A3A2

Refer to Figure 7-12 for the schematic diagram of the Second Converter Assembly.

The Second Converter Assembly A1A3A2 accepts the 2200 MHz IF from the RF Amplifier Assembly A1A3A1. The Second Converter Assembly filters the 2200 MHz IF signal and then downconverts it to a 30 MHz IF.

Assembly Functions

The main functions of the Second Converter Assembly are as follows:

1. Filter the 2200 MHz IF
2. Provide the 2170 MHz Second Local Oscillator signal
3. Downconvert the 2200 MHz IF signal to a 30 MHz IF signal

Assembly Circuits

The main circuits on the Second Converter Assembly are as follows:

1. 2200 MHz bandpass filter
2. 2170 MHz oscillator
3. Second Converter, Mixer CR1

Circuit Operation

2200 MHz Bandpass Filter

The 2200 MHz signal enters the assembly through input connector J1 and goes directly to the 2200 MHz bandpass filter. This is a 3 pole, quarter wave, stub tuned, coaxial cavity filter formed by resonators Z1, Z2 and Z3. The bandwidth of the filter is 8 MHz and its insertion loss is approximately 2 dB. The signal exits the filter via output connector J2 and passes through cable W1 en route to the Second Converter. The signal enters the Second Converter circuit through connector J4.

2170 MHz Local Oscillator

The 2170 MHz local oscillator is formed by transistor Q1, quarter wave, stub tuned resonator Z4, and their associated circuitry. The circuit is powered by −15 volts DC applied through pin 3 of plug P1. A decoupling section formed by capacitors C2 and C3, resistor R5, and inductor L6, removes extraneous signals from the DC input.

Transistor Q1 is a tuned collector oscillator with feedback provided to its emitter by coil L2. Bias for Q1 is provided by the divider formed from resistors R2 and R3. The bias is stabilized by resistor R1. Capacitor C5 returns the base of Q1 to RF ground. Resonator Z4 determines the resonant frequency of the tuned collector of Q1.

The 2170 MHz signal is coupled from the resonator cavity by the capacitive probe on the end of J3, an SMA connector. The signal output level is adjusted by turning the SMA connector to set the probe depth. The signal then passes through J3 and is input to the Second Converter circuit through connector J5.

Second Converter

The Second Converter is formed by diode CR1 and its associated circuitry. The 2200 MHz IF signal is input through connector J4. Inductor L4 and capacitor C9 provide input impedance matching.

The 2170 MHz local oscillator signal enters through connector J5. Resistors R6, R7 and R8 form a 3 dB attenuator which provides isolation and reduces the signal to approximately 10 dBm.

Resistors R9 and R10 provide an attenuated sample of the 2170 MHz signal at Test Point TP1. The signal level at TP1 is approximately −15 dBm.

Impedance matching for the 30 MHz mixer output signal is provided by inductor L5 and capacitor C10. J6 is the output connector and from there the 30 MHz signal goes to the 30 MHz Preamplifier Assembly A1A3A3. See Figure 7-13.

4-9. CIRCUIT DESCRIPTION OF 30 MHz PREAMPLIFIER ASSEMBLY A1A3A3

Refer to Figure 7-13 for the schematic of the 30 MHz Preamplifier Assembly.

The 30 MHz Preamplifier Assembly accepts the 30 MHz IF from the Second Downconverter Assembly. The preamplifier assembly filters, amplifies, and controls the gain of the 30 MHz signal.

Assembly Functions

The main functions of the 30 MHz Preamplifier Assembly are as follows:

1. Filter the 30 MHz IF signal
2. Amplify the 30 MHz IF signal
3. Vary the gain of the 30 MHz IF signal

Assembly Circuits

The main circuits in the 30 MHz Preamplifier Assembly are as follows:

1. 2, 30 MHz bandpass filters
2. 1, 22 dB gain amplifier
   1, 12 dB gain amplifier
3. 2 switched gain amplifiers, each with 2 gain states, 1 dB or 16 dB

Circuit Operation

First 30 MHz Bandpass Filter

The 30 MHz signal comes from J6, the output connector of the Second Converter Assembly. The signal is input through connector J1 and passes through the first 30 MHz bandpass filter which is formed by inductors L1 through L6, and capacitors C2 through C7. This is a modified elliptic function filter having a bandwidth of approximately 5.5 MHz.

Inductor L3 and capacitors C5 and C6 cause a deep notch at approximately 22.5 MHz. See Figure 4-1. Inductor L2 and capacitors C3 and C4 form a deep notch, or high frequency cutoff, at 39.8 MHz. Inductor L5 and capacitor C7 form an additional notch between 51 and 56 MHz to provide greatly increased rejection of frequencies above the 39.8 MHz cut-off point.

From Inductor L6 the filtered 30 MHz signal is applied through capacitor C8 to the base of transistor Q1.

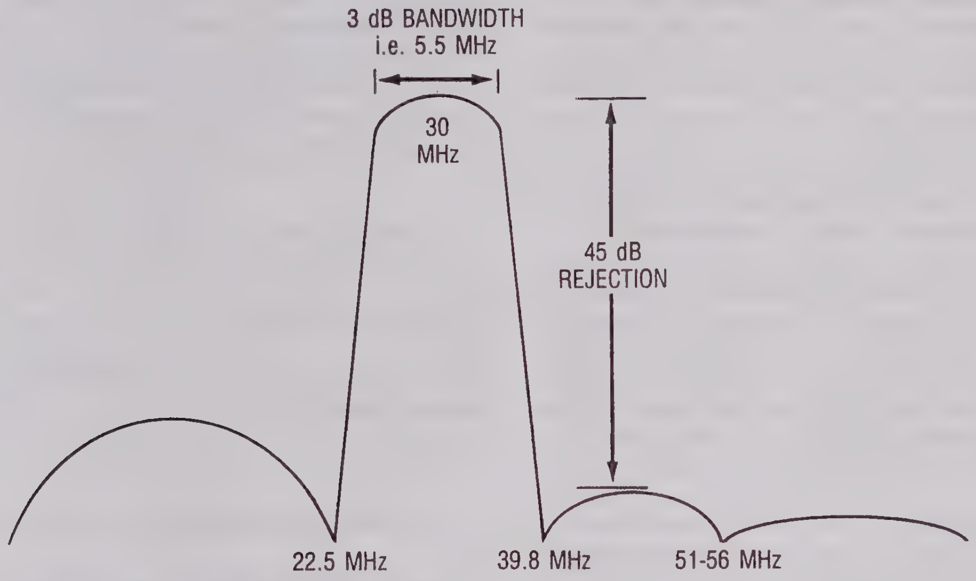


Figure 4-1. 30 MHz BANDPASS FILTER CHARACTERISTICS

22 dB Gain Amplifier

Transistor Q1 is a common emitter amplifier with feedback to provide a constant termination impedance for the first bandpass filter. Transistor Q2 is an emitter follower which provides isolation between the output of Q1 and the input to the next filter.The amplified 30 MHz signal goes from the emitter of Q2 through connector J2, cable W2, and through connector J3, where it is input to the second 30 MHz bandpass filter.

Second 30 MHz Bandpass Filter

This filter is virtually identical to the first 30 MHz bandpass filter. The notch at 22.5 MHz is formed by inductor L9 and capacitors C20 and C21. The notch at 39.8 MHz is formed by inductor L8 and capacitors C18 and C19. Inductor L11 and capacitor C22 form the notch between 51 and 56 MHz. The 30 MHz signal passes from inductor L12 and is applied through capacitor C23 to the base of transistor Q3.

12 dB Gain Amplifier

Tansistor Q3 is a commom emitter amplifier with feedback to provide a constant termination impedance for the second bandpass filter. Transistor Q4 is an emitter follower which provides isolation between the output of Q3 and the input to the next stage. The amplified 30 MHz signal goes through R25 and is applied to the input of the first 1 or 16 dB switched gain amplifier.

1 or 16 dB Switched Gain Amplifiers

The first amplifier is formed by transistors Q5, Q6, and Q7. The 30 MHz input signal is applied to the junction of capacitors C32 and C33. In the 1 dB gain state diode CR1 is reverse biased by the output of amplifier U1B. R29 is the input resistor for this amplifier stage and R33 is the feedback resistor. The overall gain for the 1 dB state is determined by the ratios of resistors R29 and R33.

In the high gain state, Diode CR1 is forward biased by the output of amplifier U1B. When CR1 is forward biased, resistor R30 is placed in parallel with R29 and the combined input parallel resistance becomes the effective input resistance for the amplifier. The gain of the amplifier will now be determined by the ratio of the input resistance (R29 and R30 in parallel) and the feedback resistor R33.

The output for both gain states goes through R39. It is applied to the junction of capacitors C40 and C41, and is the input to the second 1 or 16 dB amplifier.

The second switched gain amplifier is formed by transistors Q8, Q9, and Q10. In the 1 dB gain state, diode CR2 is reverse biased by the ouput of amplifier U1A. Resistor R42 is the input resistor for this low gain state, and R46 is the feedback resistor. The overall gain for the 1 dB state is determined by the ratios of R42 and R46.

In the high gain state, Diode CR2 is forward biased by the output of amplifier U1A. When CR2 is forward biased, resistor R41 is placed in parallel with R42 and the combined input parallel resistance becomes the effective input resistance for the amplifier. The gain of the amplifier will now be determined by the ratio of the input resistance (R41 and R42 in parallel) and the feedback resistor R46.

The output signal from this amplifier is passed through capacitor C45 and resistor R52, to the output connector, J6.

4-10. CIRCUIT DESCRIPTION OF SECOND 30 MHz IF, DETECTOR ASSEMBLY A1A3A4

Refer to Figure 7-14 for the schematic diagram of the Second 30 MHz IF, Detector.

This assembly accepts the 30 MHz IF from the 30 MHz Preamplifier Assembly. It amplifies, filters, controls the gain, and detects the level of the 30 MHz IF signal. It also provides a narrow band filter for the frequency calibration (FCAL).

Assembly Functions

The main functions of the Second 30 MHz IF, Detector are as follows:

1. Amplify the 30 MHz IF signal 6 or 16 dB
2. Filter the 30 MHz IF signal
3. Amplify the 30 MHz IF signal 11 or 16 dB
4. Amplify the 30 MHz IF signal to bring it within the range of the Final Detector
5. Detect the level of the 30 MHz IF signal
6. Sample, filter, and detect the 30 MHz IF signal during Frequency Calibration (FCAL)

Assembly Circuits

The main circuits in the Second 30 MHz IF, Detector are as follows:

1. 6 or 16 dB switched gain amplifier
2. 30 MHz bandpass filter
3. 11 or 16 dB switched gain amplifier
4. Amplifier (Final Detector driver)
5. Final Detector
6. Filter and Tuning Detector

Circuit Operation

The 30 MHz input signal comes from the 30 MHz Preamplifier and is applied to input connector J1. It passes through resistor R1 which is used to adjust the overall system gain for the 2075. The signal is then applied to the input of the 6 or 16 dB switched gain amplifier.

6 or 16 dB Switched Gain Amplifier

The amplifier is formed by transistors Q1, Q2 and Q3. The signal is applied to the junction of capacitors C1 and C2. In the 6 dB gain state, Diode CR1 is reverse biased by the output of amplifier U1. Diode CR2 and resistor R5 provide a constant load at the end of R1, when CR1 is reverse biased. Resistor R2 is the input resistor for this amplifier stage, and resistor R7 is the feedback resistor. The overall gain for the 6 dB state is determined by the ratios of R2 and R7.

In the 16 dB gain state, diode CR1 is forward biased by the output of amplifier U1. When CR1 is forward biased, resistor R4 is placed in parallel with resistor R2. The combined parallel resistance becomes the effective input resistance for the amplifier. The gain of the amplifier will now be determined by the ratio of the input resistance (R2 and R4 in parallel) and the feedback R7. The output from this amplifier stage is applied through R12 to a 30 MHz bandpass filter.

30 MHz Bandpass Filter

Capacitors C7, C8, and Inductor L2 form a 30 MHz bandpass filter. The purpose of this filter is to reduce the noise generated by the three previous wideband amplifier stages. The bandwidth of this filter is approximately 8 MHz. The filtered output signal goes to connector J2 through cable W2 and into connector J3 where it is applied to an 11 or 16 dB switched gain amplifier.

11 or 16 dB Switched Gain Amplifier

The amplifier is formed by transistors Q4, Q5 and Q6. The signal is applied to the junction of capacitors C11 and C12. In the 11 dB gain state, Diode CR8 is reverse biased by the output of amplifier U1. Diode CR7 and resistor R15 provide a constant load at the end of inductor L2 when CR8 is reverse biased. Resistor R17 is the input resistor for this amplifier stage and resistor R21 is the feedback resistor. The overall gain for the 11 dB state is determined by the ratios of R17 and R21.

In the 16 dB gain state, diode CR8 is forward biased by the output of amplifier U1. When CR8 is forward biased, resistor R16 is placed in parallel with resistor R17. The combined parallel resistance becomes the effective input resistance for the amplifier. The gain of the amplifier will now be determined by the ratio of the input resistance (R16 and R17 in parallel) and the feedback resistor R21. The output from this amplifier stage is applied through capacitor C19.

30 MHz IF Test Output

From the output side of capacitor C19, the 30 MHz signal is sampled through an attenuator formed by resistors R26 and R68. The attenuated signal is then passed through a 35 MHz lowpass filter composed of capacitors C53, C55, and inductor L14. The filtered output signal is coupled through Capacitor C54 to connector J6. From here, the signal is routed to the 30 MHz IF Output connector on the rear panel.

Detector Driver

Also from the output side of capacitor C19, the 30 MHz signal is applied through resistor R29 to the base of transistor Q7. Q7 is the Detector Driver and its purpose is to provide additional fixed gain amplification before the 30 MHz signal is applied to the Final Detector. This is a common emitter amplifier with feedback in the emitter circuit to raise the collector impedance and provide RF gain stability.

The collector of Q7 is connected to inductor L9 which further increases the collector impedance of Q7. This is to cause amplifier Q7 to function as a current source to drive detector diodes CR9 and CR10.

Capacitor C25 and inductor L9 are used to provide circuit resonance over a broad bandwidth (greater than 20 MHz wide). The amplified output signal passes through resistor R33 and capacitor C26 and is applied to the input of the Final Detector.

Final Detector

This is a full-wave, temperature compensated, envelope detector. The DC output range is from .2 volts to 5.0 volts. The output voltage is equal to 20 times the log of V1 over V2 where V1 is the noise ON voltage (noise source drive voltage is applied) and V2 is the noise OFF voltage (no noise source drive voltage is applied). The accuracy of this detector is better than .02 dB for a 10 dB change.

The signal from capacitor C26 is applied to the junction of diodes CR9 and CR10, the negative and positive detector diodes. The reason a full wave detector is used, is to provide equal loading on the detector driver for both the positive and negative portions of the signal. The output of CR10 (the positive detector) is routed through inductor L10 and out J4 to the A to D converter on assembly A1A2A8. A portion of this output is sampled through resistor R69 and output through connector J5 to the rear panel of the 2075. Capacitors C29 and C30 filter the output from CR10. Inductor L22 and capacitor C33 form a lowpass filter to keep RF from being applied to the A to D converter. The output of the negative detector CR9 is not used.

The ground reference for the detectors is located at the A to D converter on assembly A1A2A8. Because of this, the outer shell of connector J4 is not grounded on the A1A3A4 assembly.

Diodes CR11 and CR12 are used to monitor temperature and adjust the bias current flowing in detector diodes CR9 and CR10. Resistor R40 is used to adjust the bias on CR9 and CR10 through operational amplifier U2 and emitter follower transistor Q8. This bias adjustment is used to extend the linearity of detector CR10 at low levels of input signal.

Narrowband Bandpass Filter And Fo Tuning Detector (FCAL)

The input signal at connector J1 is also routed to resistors R44 and R45 which form a 20 dB attenuator. Transistor Q9 amplifies the signal presented at the junction of R44 and R45 by 20 dB. The purpose of attenuating and then amplifying the signal is to isolate the narrowband filter which follows from the main signal path.

The output from transistor Q9 is connected to a 30 MHz narrow band bandpass filter whose bandwidth is approximately 400 kHz. The filter is formed by capacitors C42, C43, C44, C45, C46 and inductors L11, L12 and L13. The detected signal from diode CR13 is applied to operational amplifier U1. Diode CR14, resistor R57, and capacitor C48, working in conjunction with U1, form a slope change detector/one-shot multivibrator. During a frequency calibration (FCAL), the YIG local oscillator on assembly A1A3A5 is tuned up towards 2200 MHz (the first IF frequency) in 100 kHz steps. This 2200 MHz local oscillator signal leaks through the first mixer and is later downconverted to the final IF of 30 MHz. As the YIG local oscillator approaches 2200 MHz and the final IF approaches 30 MHz, the input to the slope change detector/one-shot multivibrator approaches its peak level. (The 30 MHz narrowband bandpass filter filters out signals which are not centered on 30 MHz.)

Capacitor C48 will be charged through diode CR14. The signal level present on pin 10 of U1 will be approximately .3 volts less than that applied to pin 9 of U1. This will cause the output of U1 to be driven to approximately −14 volts. After the peak is reached, the signal at the output of U1, pin 14, will decrease. When the signal has decreased by approximately .4 volts, pin 9 will be less positive than pin 10 of U1. This will cause the pin 8 output of U1 to go to +13 volts. This voltage will be applied through C48, back to pin 10, causing the pin 8 output of U1 to remain high for approximately .3 seconds. This high level is divided by resistors R59 and R61 and applied to pin 7 of P1. When the microprocessor senses this signal, it issues the appropriate commands to cause the YIG local oscillator to stop tuning. The tuned frequency at this point will be recognized as 2200 MHz for the YIG local oscillator, or 0 MHz at the RF input connector of the 2075. All frequency tuning for the 2075 is referenced to this point.

4-11. CIRCUIT DESCRIPTION OF YIG OSCILLATOR AND DRIVER ASSEMBLY A1A3A5

Refer to the schematic diagram of Figure 7-15.

This assembly accepts tuning commands from the Digital to Analog converter located on the A1A2A8 board and tunes the YIG local oscillator to the desired frequency. The full tuning range extends from 2210 MHz to 4100 MHz.

The main functions of this assembly are:

1. Tune the YIG local oscillator
2. Supply the local oscillator signal to the first mixer on assembly A1A3A1

The main circuits on this assembly are:

1. The temperature stable voltage reference
2. The voltage to constant current amplifier
3. The YIG oscillator
4. The ramped voltage control (on 2075's with serial numbers 101 through 285 only)

Circuit Operation

Temperature Stable Voltage Reference

U3 is a 6.95 volt voltage reference integrated circuit. It contains an oven and a voltage reference having a stability of .0001% per degree Centrigrade. This voltage is used to reference the low end frequency of the YIG oscillator. Resistor R14 is used to adjust the low end frequency.

Voltage to Constant Current Amplifier

The purpose of this circuit is to maintain a constant current flow through the YIG coil regardless of temperature/resistance changes in the coil.

The 6.95 volt reference voltage is applied to pin 2 of operational amplifier U2 through resistors R14 and R15. U2 provides the base drive for transistor Q3. The current flow through the YIG tuning coil and through transistor Q3 will develop a voltage at the junction of resistor R1 and transistor Q3 (R1 is a 10 watt, 25 ohm resistor located off the board.) This voltage is connected to feedback resistor R18. Because of the temperature stability of the voltage reference and the resistors used in this circuit, a constant voltage will be developed at the end of resistor R1 which will result in a constant current flow through the YIG coil.

A tuning voltage from the D to A converters, located on the A1A2A8 board, is applied to input connector J1. This voltage is then applied through resistors R12 and R16, to pin 2 of operational amplifier U2. As this tuning voltage varies, it will cause a variation in the current flowing through the YIG coil, which in turn, varies the YIG output frequency.

Resistor R16 is used to adjust the YIG frequency at the high end of its tuning range.

YIG Oscillator

The Yttrium Iridium Garnet oscillator is used as the first local oscillator, driving the first mixer, in the RF amplifier Assembly A1A3A1. The first mixer upconverts the 2075 RF noise input to the first IF frequency of 2200 MHz. By varying the current though the YIG tuning coil, the oscillator is caused to vary in frequency. The YIG oscillator is the only tuning element in the 2075 by which the noise input frequency band is selected. An internal heater in the YIG oscillator is used to quickly stabilize its operating temperature when AC power is first applied to the 2075.

Ramped Voltage Control

This circuit is used only in 2075's with serial numbers 101 through 285. Because serial numbers 286 and up use a lower power YIG oscillator, the ramped voltage control circuit is not required.

The purpose of this circuit is to provide a ramped voltage to the +VC (plus voltage control) connection of the YIG oscillator to meet the required voltage versus frequency curve as specified by the YIG manufacturer.

The circuit is composed of operational amplifier U1 and transistors Q1 and Q2.

When the tuning voltage input to coaxial connector J1 is at 0 volts, resistor R8 is used to set the low VC level to its required value of 7 to 13 volts. When the tuning voltage is at 10.2 volts, resistor R2 is used to adjust the VC voltage to its high value of 14.5 volts.

4-12. CIRCUIT DESCRIPTION OF FRONT PANEL INTERFACE AND APU ASSEMBLY A1A2A1

Refer to schematic diagram of Figure 7-16.

This board consists of two main sections, the Front Panel Interface circuitry shown on the right half of the schematic, and the Arithmetic Processor Unit shown on the left half. The Arithmetic Processor Unit performs all mathematical calculations in the 2075. The Front Panel Interface handles all communications between the Keyboard and Display Assemblies and the system CPU.

APU

Integrated circuit U2 is the floating point arithmetic processor. It is driven by the 2 MHz system clock signal which enters this board via pin 49 of plug P1. Two DC voltages, +5 and +12 volts, are required to operate the processor. The +5 volt potential is supplied through pin 2 of P1. The +12 volt potential is provided by U12, a 7812 voltage regulator.

The control line inputs to the processor are applied through pins 29, 31, 32, and 49 of plug P1. These inputs are buffered by U7 en route to the processor.

Data to and from the processor is applied through pins 7 to 14 of P1 and through transceiver U1. Commands to the processor are applied on these same lines.The state of control line A0, on pin 29 of P1, allows the processor to distinguish between data and commands.

Integrated circuit U8 functions as a pulse stretcher. When the processor enable signal, ˉAPUENˉ, is applied to pin 19 of U1, it is also applied to pin 9 of U8. U8 holds ˉAPUENˉ low long enough to get the correct timing. The signal ˉAPUENˉ comes from pin U3, which is located in the Front Panel Interface section of this board.

Chip U10 provides a software reset function which is used before loading commands and data into the processor. This function is completely under software control.

The signal ˉSYSRSTˉ is applied through pin 47 of P1 when the 2075 is powered on. This causes a hardware reset of the APU.

When the APU is performing a calculation, the signal ˉWAITRQˉ at pin 45 of P1, is held low. When the calculation is completed and the data is therefore valid, the APU signals the CPU by setting the ˉWAITRQˉ line high. Thus it functions as a slow memory and provides the handshake for APU output data.

Front Panel Interface

Connector J1 goes to a ribbon cable which connects the Front Panel Interface to the Keyboard Assembly and the Display Board Assembly. The Front Panel Interface circuitry provides decoding for those boards.

Integrated circuit U13 buffers data from the CPU to the displays. The data comes from the CPU through Pins 7 through 14 of P1 which are the data input lines to buffer U13. The buffer output lines go through pins 1 through 8 of J1, through the ribbon cable, and to the displays on the Display Board.

Integrated circuit U3 provides high level address decoding to the Display Board and the Keyboard. U3 output signals ˉDSPENˉ and ˉANNENˉ go to the Display Board where they enable respectively the address decoder for the seven-segment displays or the address decoder for the bar graph annunciators. The signal ˉKEYENˉ goes to the Keyboard where it enables the row scanner for the key matrix.

U4 is an address buffer for address lines from the CPU to the Keyboard and the Display board. Pins 9, 10 and 11 of J1 go to the address lines for the key matrix row scanner on the Keyboard Assembly. Pins 9, 10, 11, and 12 of J1 go to the address lines of the address decoders on the Display Board.

Integrated circuit U14 is a CMOS dual D/A converter. It converts the digital data from pins 7 through 14 of P1, into analog voltages which drive Meter 1 and Meter 2 on the Display Board. The full scale output voltage is +10 volts and the minimum is 0 volts.

When a key is depressed, the Keyboard sends the signal ˉKEYIRQˉ to notify the CPU that service is required.This signal comes from the Key-down Detector and the key interrupt request latch, U3, on the Keyboard assembly. The signal is input to the Front Panel Interface via pin 21 of J1. It exits as ˉIRQˉ to the CPU on pin 44 of P1.

4-13. CIRCUIT DESCRIPTION OF RAM AND BATTERY BACK-UP RAM ASSEMBLY A1A2A2

Refer to the schematic diagram of Figure 7-17.

This board contains 6K of expansion RAM for the digital system. Integrated circuits U2, U3, and U4 are the memory address buffers.

RAM chip U7 contains the first 2K of memory. This is the battery backed-up RAM and it holds important information such as the noise source ENR tables and front panel control parameters. Its address locations are from 2000 to 27FF.

RAM chips U8 and U9 are volatile memory and their data is lost when AC power is removed from the 2075. Address locations for U8 are from 2800 to 2FFF. Address locations for U9 are from 3000 to 37FF.

U10 is actually an empty socket which can accomodate an optional ENR ROM chip. This chip contains noise source calibration data (frequencies and ENR values) for a specific noise source which must be ordered with the chip. Its address locations are from 3800 to 3FFF. When the chip is installed, it can be accessed using special function 5.4.

Transistors Q1, Q2, and Q3 form the RAM power-up circuitry. When the power is applied, the potential at pin 2 of P1 becomes higher than the Zener voltage of diode CR1. This turns on transistor Q3. The collector of Q3 will be low, enabling the RAM write line through U5.

When Q3 turns on, it causes Q2 to turn on, and this allows the +5 volts from pin 2 of P1 to come through and be applied to pin 24 of U8, U9 and U10. It also allows the +5 volts to be applied to the NiCd batteries and begin charging them.

When Q3 turns on, it also causes transistor Q1 to turn off, and this allows capacitor C1 to charge. This releases the signal PBRST and allows the reset circuit to function when needed. When PBRST goes high, it notifies the CPU that the RAM is ready to be accessed.

The signal, ˉMEMRQˉ, on pin 34 of P1, is set high by the CPU, when the memory is to be accessed.

4-14. CIRCUIT DESCRIPTION OF MICROPROCESSOR ASSEMBLY A1A2A3

Refer to the schematic diagram of Figure 7-18.

This board contains the CPU which is the main control unit for the 2075.

Integrated circuit U10 is the CPU, a Motorola MC6808, 8-bit microprocessor.Its address lines are pins 9 through 25, and these are decoded by U14, U7A and U7C, U8E and U8F, and U11C. The address decoding scheme provides access to on-board RAMs, U5 and U6, as well as RAMs and ROMs located on other digital assemblies. U5 and U6 are static 2K by 8 CMOS RAMs which provide 4K of on-board memory for the CPU. When access to off-board memory is required, the CPU sets the ˉMEMRQˉ signal on pin 34 of P1 to a low state. Off-board memory addressing is further decoded by the individual memory boards.

Integrated circuits U2 and U3 buffer the microprocessor address lines as they exit to the bus via plug P1. The resistors in resistor packs R1 and R2 are pull-up resistors.

Pins 26 through 33 of U10 are the microprocessor data lines. These are buffered by transceiver U1, which handles data exchanges to and from the bus. The resistors in resistor pack R3 are data line pull-up resistors.

U4 is a buffer for various control signals by which the microprocessor controls different functions in the rest of the digital circuitry. Resistor pack R4 consists of pull-up resistors.

Chips U8A and U8D, and U12B and U12C, create the read and write signals (ˉRDˉ and ˉWRˉ) required by the bus. The ˉI/O RQˉ signal allows access to external I/O via the GPIB Interface A1A2A5. These signals are all buffered through U4 on their way to the bus.

The signal ˉNMIˉ, on pin 46 of P1, comes from the GPIB I/O Assembly. It is a non-maskable interrupt which notifies the CPU that the GPIB requires servicing.

The ˉKEYIRQˉ signal comes from the Keyboard Assembly via the Front Panel Interface, and is applied through pin 44 of P1. This signal is the interrupt request which notifies the CPU that a key has been pressed and service is required.

The ˉWAITRQˉ signal comes from the APU and is applied to pin 45 of the standard bus. Chip U9B uses this signal to synchronize the microprocessor and the APU. The APU functions like a slow memory while it is performing calculations. It sets the ˉWAITRQˉ signal to low, to hold off the microprocessor cycle until the APU calculations are completed.

The RAMRDY signal comes from the RAM and BBU RAM Assembly A1A2A2. After AC power is applied to the 2075, this signal, applied to pin 48 of P1, goes high to notify the CPU that RAM voltages have reached operating potential, and RAM is available for access.

When AC power is applied to the 2075, integrated circuit U15 generates the power-up reset, or ˉSYSRSTˉ, signal for the microprocessor. This reset signal is applied long enough to allow clock circuit U13 to stabilize at 4 MHz. The 4 MHz clock signal is divided down to 2 MHz by U9A . The 2 MHz ˉCLKˉ signal is then buffered through U4 to pin 49 of the standard bus, and is used by the math processor (APU) on the Front Panel Interface Board.

The CPU and the other digital circuit boards in the 2075 plug into the industrial standard, STD BUS. The bus connection for each digital assembly is plug P1. The STD BUS was chosen for convenience of design rather than for compatibility with other STD BUS systems.

The memory map as defined by the CPU board is:

0000-07FF	CPU RAM 1 (2K) (U6)
0800-0FFF	CPU RAM 2 (2K) (U5)
1FOO - 1FFF	I/O Request (256 bytes)
remainder	Off-Board Memory Request

4-15. CIRCUIT DESCRIPTION OF ROM ASSEMBLY A1A2A4

Refer to the schematic diagram of Figure 7-19.

This board holds six 8K by 8 type EPROMs, U7 through U12, which provide a total of 48K, 8 bit memory locations. (U5 and U6 are not used, and do not exist.) All CPU instructions are stored in these ROMs.

Pins 15, 17, 19, and 21 through 30 of plug P1, are the memory address lines from the standard bus. These are buffered by memory address buffers U1 and U2. Integrated circuit U3 is a higher level memory address decoder. It decodes address lines 16, 18, and 20 to select 1 of the 6 EPROMs. Pins 17 through 14 of P1 are the memory data lines.

Pins 32 and 34 of P1 carry ˜RD˜ and ˜MEMRQ˜, which are memory control signals from the CPU. These signals enable the high level address decoder U3, and the 6 EPROMs.

4-16. CIRCUIT DESCRIPTION OF GPIB INTERFACE ASSEMBLY A1A2A5

Refer to the schematic diagram of Figure 7-20.

This board is responsible for all communications of the 2075 to the outside world through the GPIB interface. Connector J1 connects to a ribbon cable which goes to the GPIB connector on the 2075 rear panel.

Connector P1 connects to the STD BUS, which handles the internal digital communication of the 2075.

Switch SW1 is a 5-bit DIP switch which can be configured to set the GPIB address of the 2075 in the event of a Battery Back-Up RAM failure. Normally, the GPIB address is set by the user via the front panel and stored in Battery Back-up RAM, and SW1 is not used. However if the BBU RAM has failed, SW1 can be used to set the address. With the A1A2A5 board oriented so that the edge connector finger contacts are on the left, the right most bit (Bit 5) of SW1 is the Least Significant Bit. The circuit board is screened to show which position is a logical 0 and which is a logical 1. Set the bits accordingly to set the desired address.

Resistor pack R1 contains pull-up resistors for the SW1 lines. Integrated circuit U1 is a data buffer that allows the CPU to read SW1.

U3 is a general data buffer between the STD BUS and the MC68488 GPIB Chip, U7. The MC68488 is a controller which handles the low level GPIB handshake functions for the 2075. Integrated circuits U8, U9, U11, and U12 are bus transceivers which have internal resistor terminations to meet GPIB requirements. Transceivers U8 and U9 handle the 8 GPIB data lines, DIO 1 through DIO 8. Transceivers U11 and U12 handle the GPIB handshake and control signals.

This board operates somewhat differently from a standard GPIB board in that it can act as a GPIB partial Controller. That is, besides being a GPIB LISTENER/TALKER, it can also act as a special GPIB CONTROLLER to address and control an external local oscillator via the GPIB, when there is no other CONTROLLER on the bus. This capability is provided by U4 and U5, acting in conjunction with U6.

When the 2075 is required to act as the GPIB CONTROLLER, pin 15 of U4 will be set high to enable U12. This will allow the REN and ATN lines to go out to the GPIB, and places all detailed bus activity under control of the 2075 firmware.

Integrated circuit U2 is an address decoder which decodes the I/O map into the following:

U2 Output, Y4	1FE0-1FE7
U2 Output, Y5	1FE8-
U2 Output, Y6	1FF0-

4-17. CIRCUIT DESCRIPTION OF DMAC AND DISPLAY RAM ASSEMBLY A1A2A6

Refer to the schematic diagram of Figure 7-21.

After a measurement is made by the 2075, the CPU scales the resulting data to agree with upper and lower limits previously entered by the user. These upper and lower limits are used when displaying data on an oscilloscope or plotter.

This board stores the image of the noise or gain measurement data and then regenerates it to drive an external oscilloscope or plotter via the Scope Driver Assembly. This board contains 1K of RAM which is used exclusively for storing the scaled noise and gain measurement data. The Direct Memory Access Controller (DMAC) is used as an image refresher. It provides high speed data output from the RAM to the Scope Driver Assembly via J1.

Integrated circuits U1, U2 and U3 are bus isolators. Their purpose is to isolate the STD BUS activity from the internal memory addressing activity on this board. U1 isolates the data lines, while U2 and U3 isolate the memory address lines.

The scaled data comes from the CPU, enters this board via U1, and is stored in RAMs U7 and U8. The Direct Memory Access Controller, U6, is shut off at this time by U4. After all the data has been stored in the RAMs, U4 will turn on the refreshing activity. Then the DMAC will cause the data from the RAMs to be written out through J1 to the Scope Driver Assembly. For the system to work properly, RAMs U7 and U8 must have an access time of 200 nanoseconds or less, and the DATA STROBE generated by U13 must have a pulse width of 250 to 350 nanoseconds. Data strobing and read/write control are done by U5, U9 and U12.

U6 is driven by a chain of flip-flops consisting of U18, U14 and U11.

U15 allows the necessary oscilloscope or plotter functions to be activated. These include ˜PENLIFT˜ , SCOPE/˜PLTR˜, and STOP/RUN, which are output through pins 9, 10 and 11 of J1.

Pin 12 of output connector J1 carries the signal BA0, buffered address zero. This serves as an odd or even address indicator for the Scope Driver Assembly.

U4 is an address decoder which maps the memory into the following:

1000 to 100F	DMAC Internal Registers
1400 to 17FF	Image RAM
1800	Function Control Byte

4-18. CIRCUIT DESCRIPTION OF SCOPE DRIVER ASSEMBLY A1A2A7

Refer to the schematic diagram of Figure 7-22.

The Scope Driver Assembly receives digital data from the DMAC and Display RAM Board. This data is received as digital data representing discrete X and Y data points for display on an external oscilloscope or plotter. This board converts the digital data points to analog voltages. It also creates the ramp voltages, represented by straight line segments, which are needed to connect the data points on the oscilloscope display. Finally, the board outputs the analog voltages to the oscilloscope or plotter, via connector J2 and the rear panel X, Y and Z connectors.

U18 and U17 are the odd and even data registers. U18 receives the vertical data points (Y-axis) and U17 receives the horizontal data points (X-axis). When the signal, A0, on pin 12 of connector J1 is low, an even byte is loaded into U17, When A0 goes high, an odd byte is loaded into U18. When A0 goes high, it also triggers U12B via U4 and U13. The output from U12B triggers U12A, which causes both bytes to be simultaneously loaded from U18 and U17, into D to A converters U19 and U16. Each two bytes represent one discrete data point on the oscilloscope or plotter.

U5 is a sample and hold circuit for the analog voltage from U19. The output from U5 goes to operational amplifier U10, and then to output buffer U9. C19 is a holding capacitor which is charged by the output from U10. This capacitor holds the charge which is used to create the vertical or Y-axis ramping voltage. This voltage is output to the oscilloscope or plotter to draw the line segments between discrete data points.

U1, U6 and U7 perform the same functions for the X-axis output, as U5, U10 and U9 perform for the Y-axis.

U3A and U3B, in conjunction with U2B, Q1 and U8, form the retrace blanking and alternate dimming circuit. The retrace blanking circuit generates the signal for blanking the Z-axis during scope retrace, or the pen lift signal for a plotter. The alternate dimming circuit generates the signal for dimming the Z-axis during alternate traces. The alternate trace signal has no application for a plotter.

U15 is the end of trace detector. When the last data point in a trace is reached, the output from RAMs U17 and U18 is FF. This output is sensed by U15, which causes alternate trace flip-flop U3B to change states and dim the Z-axis.

4-19. CIRCUIT DESCRIPTION OF ANALOG/DIGITAL I/O ASSEMBLY A1A2A8

Refer to the schematic diagram of Figure 7-23.

The Analog/Digital I/O Board is part of the interface between the RF and Digital sections of the 2075. This board accepts the analog output voltage from the Final Detector and converts it to a digital value which can be read by the CPU. It also receives a digital tuning value from the CPU, converts it to an analog tuning voltage, and applies it to the driver of the YIG local Oscillator. The A/D I/O Board also sends digital control signals for gain and attenuation to the Interconnect Board A1A4, which in turn, distributes them to the appropriate RF and IF assemblies.Finally, this board also sends control signals to the Interconnect Board which turn the NOISE DRIVE voltage and RELAY POWER voltage on or off.

Integrated circuit U3 is a 12 bit digital to analog converter. This is the primary tuning device and is responsible for converting a digital value from the CPU, to an analog tuning voltage for the YIG local oscillator. Data is written into U3, 4 bits at a time, in three consecutive writes.

U4 is an 8 bit digital to analog converter which serves as the auxiliary tuning device. Because it has a built in latch, it can hold its digital input while maintaining its analog output. This converter provides the capability for 100 kHz frequency stepping during frequency calibration (FCAL), and also the 100 kHz frequency resolution for swept measurements in Test Configuration 1.

U8 is a 16 bit analog to digital converter which is the primary data acquisition device for the 2075. Through input connector J2, it receives the analog voltage output from the Final Detector. It is capable of acquiring this data in a conversion time of 45 microseconds or less. The 16 bit output from the converter is applied to data buffers U9 and U13.

Integrated circuit U5 is an address decoder. It decodes address lines A4 through A7 into function select signals required by other circuits on this board. The output lines from U5 control the following activities:

Y0 sends the converted signal to 16 bit converter U8.

Y2 causes buffer U13 to read the least significant byte from converter U8.

Y3 causes buffer U9 to read the most significant byte from converter U8.

Y4 and Y5 enable converter U3.

Y6 enables converter U4.

Y8 enables data buffer U12 to read the RF status lines.

Y10 enables latch U16 which controls NOISE DRIVE and RELAY POWER voltages.

Y12 enables U15, the output latch which controls IF attenuation.

Y13 enables latch U14 which controls RF attenuation.

4-20. CIRCUIT DESCRIPTION OF MOTHERBOARD ASSEMBLY A1A2A9

Refer to the schematic diagram of Figure 7-24.

The Motherboard is a printed circuit board which conforms to the pin configuration requirements of the industrial standard STD BUS. This board contains no circuitry. However, it does contain 8 PCB edge connectors into which the other 8 digital assemblies are plugged. The function of this board is to provide the digital interlink, or microprocessor bus, which allows the other digital assemblies to communicate with each other. It also distributes the +15, −15, and +5 DC voltages which are required by the digital assemblies.

4-21. CIRCUIT DESCRIPTION OF KEYBOARD ASSEMBLY A1A1A1

Refer to the schematic diagram of Figure 7-25.

The Keyboard is mounted on top of the Display Board, directly behind the front panel. It communicates with the Display Board and with the Front Panel Interface Board through a ribbon cable connected to J1.

When a key is pressed, its row and column, in the key matrix, are electrically connected together. This causes the +5 volt potential applied to the bottom of the resistors in resistor pack R10, to be applied to the tops of the resistors in resistor pack R9. The resulting current flow causes a positive potential to be felt at pin 10 of U4A, part of the Key-down Detector.

The Key-down Detector is formed by chip U4 and its associated components. Capacitors C2 and C3, and resistors R4 and R5 form a key debouncing circuit.When the Key-down Detector detects the high potential caused by a keystroke, it generates an interrupt to the CPU. This interrupt is stored in latch U3, and it signals the CPU that a key has been pressed and must be read. Pin 5 of U3 applies the signal, ˉKEYIRQˉ, through pin 21 of J1.

Chip U1 is the row scanner for the key matrix. To read a key, the CPU begins sequentially addressing the row scanner via its address lines, pins 10, 11 and 12 of connector J1. When it receives each address, the row scanner places a low on the addressed row. Only one row at a time is addressed and held low by the scanner.

When the low potential is finally applied to the row which contains the depressed key, it is also applied to the column, because pressing the key connected the row and the column electrically. When the low is applied to the column, it is also applied to the data buffer U2. After each address is sent, the CPU applies the signal ˉREAD KEYˉ, to data buffer U2, and then reads the contents of U2 to determine which bit, if any, is low. When a low bit is finally read from U2, the CPU combines the number of the low bit, and the address currently applied to the row scanner, to determine the key code.

Key data decoding is performed by software, allowing the hardware configuration to be simple. When no keys have been pressed, all bits in data buffer U2 are 1. The data output lines from U2 go to pins 1 through 8 of connector J1.

These data lines also go to data latches U5 and U6. U5 drives the front panel LED bar graph annunciator which displays the smoothing factor. Latch U6 drives the keyboard LED annunciators which are imbedded in, or mounted alongside, certain keys. The latches are enabled by signals KBANN1 or KBANN2 which come from the display board via pins 28 and 30 of J1. The signal, ˉWRCLKˉ, comes from the CPU and allows the data to be written into the latches.

4-22. CIRCUIT DESCRIPTION OF DISPLAY BOARD ASSEMBLY A1A1A2

Refer to the schematic diagram of Figure 7-26.

The Display Board contains 13 seven-segment displays, 6 LED bar graphs, 2 analog meters, and 2 address decoders. This is the main display board for the front panel. The seven-segment displays display the alphabetic and numeric data in Windows A, B, and C. The LED bar graphs backlight the annunciators in these windows. The analog meters display relative analog Gain and Noise Figure Values.

Connector J1 is the connector for the ribbon cable which goes to the Keyboard and also to the Front Panel Interface Board.

Pins 9 through 12 of J1 are the address lines. These go to the address decoders, U17 and U18. Chip U17 is the address decoder for the 13 seven-segment displays. Chip U18 is the address decoder for the LED bar graphs and the keyboard annunciators. (The keyboard annunciators are those LED's which are mounted in the center of a key or mounted alongside a key. They are located on the Keyboard assembly.)

The signals, ˉDSPENˉ and ˉANNENˉ , are higher level address signals which select either U17 or U18 as the operative decoder. ˉDSPENˉ is applied to pin 18 of U17 to select decoding of an address intended for the seven-segment displays. ˉANNENˉ is applied to pin 4 of U18 to select decoding of an address intended for the LED bar graphs or keyboard annunciators. When a keyboard annunciator is to be turned on or off, the signals KBANN1 and KBANN2 are output from pins 11 and 12 of U18. These go to the Keyboard Assembly on which the keyboard annunciators are mounted.

Pins 1 through 8 of connector J1 are the data lines which come from the Front Panel Interface Board. These lines go to all 13 of the seven-segment displays and to all 6 of the LED bar graphs.

Pin 13 receives the ˜WR CLK˜ signal from the CPU to enable the writing of data into the latches of the seven-segment displays or the annunciators. This is a nonmultiplexed display configuration. After each digit of information is placed into its destination register it is turned on and then remains on.

Each seven-segment display consists of the display, a resistor pack for limiting current to the LED's, and a data latch. The seven-segment displays are DS3 through DS6 and DS9 through DS18. Chips U2 through U5, and U17 through U15, are the data latches.

The LED bar graphs are DS1, 2, 7, 8, 9, and 13.

The analog meters, Meter 1 and Meter 2, are driven by a 0 to 10 volt potential which comes from the Front Panel Interface Board.

4-23. CIRCUIT DESCRIPTION OF INTERCONNECTION BOARD ASSEMBLY A1A4

Refer to the schematic diagram of Figure 7-27.

This assembly is the interface between the digital and RF sections of the 2075. It provides DC power distribution, and control signals to the RF assemblies.

The main functions of this assembly are:

1. To provide DC power and decoupling to the RF assemblies.
2. To route gain control signals to the RF assemblies.
3. To generate and distribute the 28.000 NOISE DRIVE voltage to the front and rear panel connectors.
4. To provide for selection of either 5, 15 or 30 volts and distribute it to the front and rear panel RELAY POWER connectors.
5. To provide a two-level comparison of RF levels from the RF Overload Detector.
6. To provide an internal service status indicator of RF gain settings.

The main circuits on this assembly are:

1. Power distribution and decoupling circuitry.
2. Signal paths for gain control signals.
3. +28.000 volt precision regulator.
4. Current limited, thermally protected, RELAY POWER circuit.
5. RF level comparator with 2 TTL outputs.
6. A 10 bar LED bar graph status indicator.

Circuit Operation

Power Distribution

The 4 power supply voltages used in the 2075 are applied from the DC Power Supply to card edge connector P1 on the Interconnect Board. Each supply voltage is routed through a decoupling network and distributed to output connectors J1 through J5 which go to the RF assemblies. Some circuitry on the Interconnect Board also requires DC power and this is picked-off the decoupling networks.

Gain Control Signal Paths

The RF gain control signals come from the Analog/Digital I/O Board, A1A2A8 and are applied to connector J8, pins 2, 3, and 4. They are applied to U2 and U3. U2 drives the 10 bar LED bar graph status indicator. U3 is an open collector relay driver. Its outputs go through J1 and control the relays on the RF Amplifier Assembly A1A3A1.

The IF gain control signals also come from the A1A2A8 board. They are applied to J8, pins 5, 6, 7, and 8. They are applied to bar graph drivers U2 and U1, and also through resistors R1 through R4. From the resistors, the gain control signals go through J3 and J4 to the IF amplifiers A1A3A3 and A1A3A4 respectively.

The Fo Tuning Detector output signal is applied to pin 7 of J4. This signal comes from the Tuning Detector/ One-shot Amplifier on the A1A3A4 assembly. It is routed through resistor R5 and then applied to pin 20 of J8. From here it goes to the Analog/Digital I/O Board A1A2A8.

+28 Volt Precision Regulator

The regulator is composed of precision voltage reference U6, transistors Q5, Q6, Q7, and Q8, operational amplifier U4, and open collector inverting drivers on U3.

When the NOISE DRIVE voltage is turned on, a high TTL signal is applied to pin 9 of J8. The output of U3, pin 11, goes low and turns off transistor Q7. This allows the full 7 volts from precision voltage regulator U6 to be applied to pin 2 of operational amplifier U4. U4 provides drive for level shifter Q5 which applies base current to transistor Q8. Q8 is the series pass transistor which regulates the 30 volts from point J, down to 28.000 volts. The 28.000 volts is sampled through resistors R16, R17, and R18. Variable resistor R17 is used to set the 28.000 volts during calibration. The tapped output of R17 provides 7 volts back to pin 3 of U4. Transistor Q6 provides current limiting in the event of a short on the 28.000 volt line.

At the output of U3, pin 15 is used to pull the 28.000 volts back to 0 volts quickly, when the NOISE DRIVE voltage is turned off.

Relay Power Circuit

This circuit is composed of transistors Q1, Q2, and Q3. When the RELAY POWER is turned on, a high TTL level is applied to pin 10 of J8. This causes the output of U3, pin 10, to go to ground, which applies base current to transistor Q1, turning it on. The jumper used to select the relay voltage is connected across either E1 and E2, E3 and E4, or E5 and E6. The selected voltage level is applied through Q1 to the front and rear panel output connectors.

Transistor Q3 provides current limiting in the event of a short on the relay power line. Thermistor RT1 and transistor Q2 keep the temperature of Q1 from exceeding safe limits in the event of a short.

RF Overload Comparators

This window comparator circuit reads the output from the RF Overload detector and provides overload status to the CPU.

The RF Overload Detector output is applied to pin 8 of J1. The signal then goes to pins 5 and 10 of operational amplifier U5. U5 (pins 8, 9 and 10) functions as the RF low level comparator. When the RF Overload Detector output level exceeds .5 volts, the comparator output goes high. When the Detector output level drops below .25 volts, the comparator output goes low.

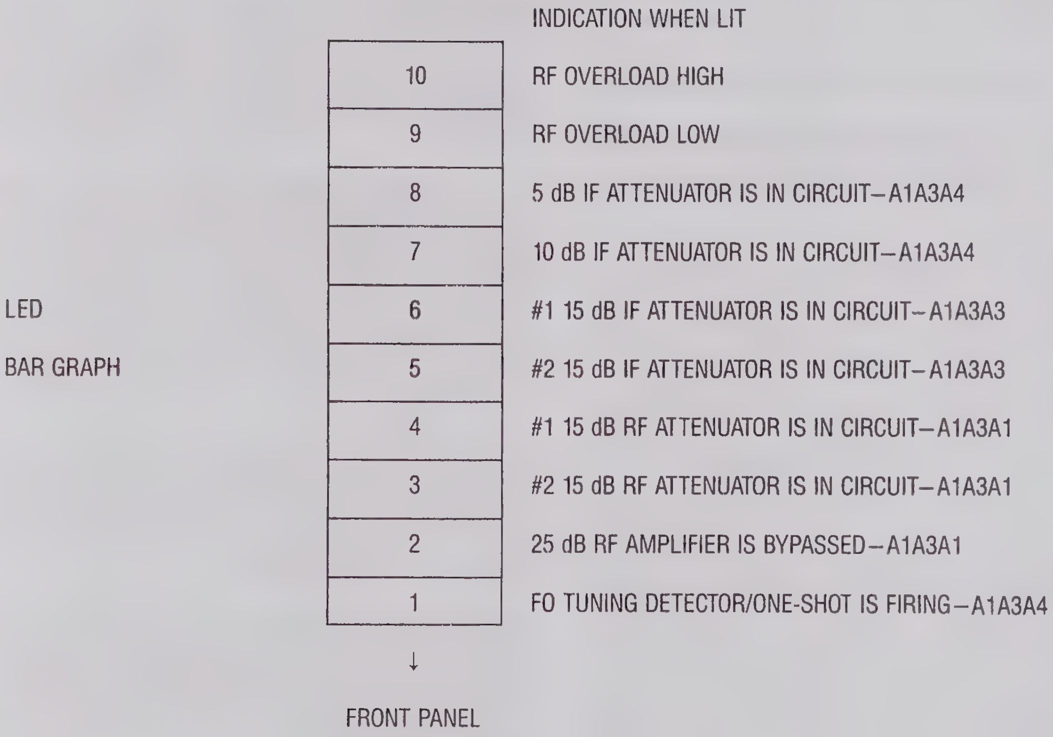
Pins 5, 6, and 7 of U5 function as the RF high level comparator. When the Detector output level exceeds 6.5 volts, the comparator output goes high. When the Detector output level drops below 5.5 volts, the comparator output goes low.

The output signals from the comparators go through pins 18 and 19 of J8 to the Analog/Digital I/O Board A1A2A8. The status of these lines is then read by the CPU which makes the appropriate decisions to set the gain in the RF Amplifier Assembly A1A3A1.

LED Bar Graph

This is mounted on the top, left edge of the Interconnect Board. It provides status indications for use by service personnel. See the diagram of Figure 4-2, for status decoding.

Electrically, the bar graph is located to receive the outputs of U1, U2 and U5, the bar graph drivers.



	INDICATION WHEN LIT
10	RF OVERLOAD HIGH
9	RF OVERLOAD LOW
8	5 dB IF ATTENUATOR IS IN CIRCUIT—A1A3A4
7	10 dB IF ATTENUATOR IS IN CIRCUIT—A1A3A4
6	#1 15 dB IF ATTENUATOR IS IN CIRCUIT—A1A3A3
5	#2 15 dB IF ATTENUATOR IS IN CIRCUIT—A1A3A3
4	#1 15 dB RF ATTENUATOR IS IN CIRCUIT—A1A3A1
3	#2 15 dB RF ATTENUATOR IS IN CIRCUIT—A1A3A1
2	25 dB RF AMPLIFIER IS BYPASSED—A1A3A1
1	FO TUNING DETECTOR/ONE-SHOT IS FIRING—A1A3A4

Figure 4-2. 10-BAR GRAPH DECODING

SECTION 5

TROUBLESHOOTING

5-1. INTRODUCTION

This section contains information useful for troubleshooting the 2075. There are two basic types of problems which may be encountered while using the instrument: problems caused by errors in operating procedure, and problems caused by a hardware failure in the instrument. The information in this section will assist the user in resolving both types of problems.

This section is divided into three parts. The first part covers possible failures which may occur when the 2075 is powered-on. A list of possible symptoms and likely remedies is given in Table 5-1.

The second part is built around the table of error messages. These messages are displayed in the event of an operator error or a hardware malfunction. For each possible error message, a course of action is given which should help in resolving the problem.

The third part of this section consists of a troubleshooting flow chart. In the event that the noise figure of the 2075 is found to be too high while performing a Second Stage Calibration, or in the event that the cascade noise figure of the 2075 is found to be too high, this flow chart may be used to locate the failing subassembly.

Before attempting to repair the 2075, the user should be familiar with the information in Section 4, Theory of Operation. This information will prove to be invaluable to understanding the operation of the 2075. The information in Section 5, Troubleshooting, can be used to locate a failing assembly. Then, the information in Theory of Operation can be used by a senior technician to repair the failing module.

5-2. POWER-ON PROBLEMS

The information in this table covers failures which occur immediately after the 2075 is powered-on. In such cases it is unlikely that an error message will be displayed.

Table 5-1. Power-On Failures

FAILURE SYMPTOM	REMEDY
No Fan	1. Check AC Fuse. Replace if necessary.
No front panel LED's	1. Check AC Fuse. Replace if necessary. 2. Check AC Voltage Selector Card and insure its correct positioning. 3. Check DC Power Supply Voltages. (See Paragraph 3-6.) 4. Check Digital Boards for tightness. 5. Check Digital Boards for dirty contacts. 6. Check or replace CPU board, A1A2A3. 7. Check Front Panel Interface Board A1A2A1.
Random segments displayed in Windows A, B, or C	1. Check Steps 2 through 7 above.

5-3. ERROR MESSAGES

The 2075 generates error messages to provide the user with information concerning incorrect keyboard entries, operator errors, and hardware errors.

There are two basic categories of error messages: Transitory and Continuous. Transitory messages are displayed for about two seconds and then disappear when the instrument reverts to its normal activities. Transitory messages usually indicate the denial of some illegal request on the part of the operator.

Continuous messages remain displayed until the error condition is corrected and the 2075 can function normally. Continuous messages may indicate either an operator error or a hardware malfunction.

The error messages are divided into ten groups as follows:

10x	ENR Table errors
11x	Calibration errors
12x	Special Function errors
13x	Range errors
14x	RF Hardware errors
15x	Digital Hardware errors
16x	GPIB errors
17x	Measurement Data errors (GPIB)
505	System errors
9xx	System errors

All messages within a particular group will begin with the same two digits. For example, 101, 102, and 103 all belong to the first group.

When the error occurs, the 2075 front panel displays Err xxx, where xxx is the message number.

Table 5-2 lists all the error messages, their meanings, and the necessary corrective actions. For some of the error messages, a paragraph which gives more information on resolving the hardware failure, has been added following the table. Refer to these paragraphs (5-4 through 5-15) when so indicated by Table 5-2. In many cases this additional information will help determine the cause of a hardware failure.

Error messages are also listed on the information pull-out card in the bottom of the 2075.

Table 5-2. Error Message Table

ERROR CODE	MEANING	CORRECTIVE ACTION
101	ENR table does not exist for this selection	Select correct ENR table. See Paragraph 2-8.
102	Attempt to modify ENR ROM table	Only tables from 5.1-5.3 can be modified.
103	ENR table overflow-more than 31 points entered	Enter no more than 31 calibration points in the table.
104	ENR table empty-no calibration data	Enter ENR data in the table before using it.
105	Frequency is lower than lowest ENR table frequency	Increase the frequency so that it is not lower than the lowest ENR table frequency or else enter the ENR value for that frequency.
106	Frequency is higher than highest ENR table frequency	Decrease the frequency so that it is not higher than the highest ENR table frequency or else enter the ENR value for that frequency.
107	ENR value greater than 18 dB	Only use ENR value greater than 18 dB with proper loss compensation.
110	Measurement at non-calibrated point	Use 24.1 to override but result will be less accurate.
111	Frequency lower than calibration table	Increase the frequency so that it is within the Second Stage Calibration range or re-calibrate.
112	Frequency higher than calibration table	Decrease the frequency so that it is within the Second Stage Calibration range or re-calibrate.
113	IF attenuators not calibrated or calibration data is wrong	Use Special Function 19.1 to re-calibrate. If this does not remedy the problem then go to Paragraph 5-4.
114	Cannot find peak during frequency calibration	Try again using Special Function 15.1. Repeated failure means hardware problem. See Paragraph 5-5.
115	Calibration data not available	Do Second Stage Calibration before attempting a Noise Figure and Gain measurement.
116	Calibration error, uncalibrated RF range	DUT Gain is greater than 2075's ability to measure. Reduce Gain of DUT or measure Noise Figure only.
117	Calibration table overflow—more than 100 points	Calibrate with 100 or fewer points (use narrower frequency range or larger step size).

Table 5-2. Error Message Table (Continued)

ERROR CODE	MEANING	CORRECTIVE ACTION
118	Calibration error, due to RF overload	Select different range using SF 16 or check the hardware. Also see Paragraph 5-6.
119	Cannot start a frequency calibration	Try again using Special Function 15.1. Repeated failure means hardware problem. See Paragraph 5-7.
121	Special function does not exist	Use valid special function.
122	Sequence not stored	Use set sequence procedure to set the sequence before using this feature.
123	DUT Configuration has conflicting parameters	Check parameters and try again.
124	Invalid to plot Gain-only while in F-only mode	Check parameters and try again.
131	Frequency range error (Stop frequency is smaller than start frequency)	Enter appropriate frequencies.
133	The IF tuning frequency is beyond 10 to 1900 MHz	Check the DUT configuration.
134	The external LO frequency is out of range	Check the RF and IF combination.
141	RF overload (RF input too high)	Reduce the RF input power.
143	Detector overload (unable to attenuate the detector to proper level)	May have hardware problem. Contact service center. See Paragraph 5-8.
151	Battery backup RAM error—data may be lost	Re-enter 2075 GPIB address and ENR table data. Perform IF CAL. Check to see if battery is OK.
152	RAM board error	Check board using SF 32.1. See Paragraph 5-9.
153	ROM board error	Check board using SF 33.x. See Paragraph 5-10.
154	GPIB board error	Check board using SF 34.2. See Paragraph 5-11. Disconnect GPIB cable and repeat test.
155	DMAC board error	Check board using SF 34.1. See Paragraph 5-12.
156	Scope RAM error	Check board using SF 32.3. See Paragraph 5-13.

Table 5-2. Error Message Table (Continued)

ERROR CODE	MEANING	CORRECTIVE ACTION
157	A/D converter error	Use SF 20.1 and 20.2 to investigate. See Paragraph 5-14.
158	Math processor error	Check board using SF 34.3. See Paragraph 5-15.
166	Illegal GPIB mode	Conflict between DUT configuration and GPIB mode.
170	Measured data is out of range	Check measurement setup.
171	Data not available	The requested data is not available in this mode.
505	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
901	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
910	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
911	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
912	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
913	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
914	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.
920	System error	Check power supply voltage: +5 to +5.25 volts. If OK and errors persist, then instrument requires service.

5-4. REMEDY FOR ERROR MESSAGE 113

Check the actual value of the IF attenuation. Connect a spectrum analyzer to the IF output connector on the 2075 rear panel. Set up the spectrum analyzer controls for a scan width of approximately 1 MHz centered at 30 MHz. The bandwidth of the spectrum analyzer should be set for 300 kHz or 1 MHz. The video bandwidth should be set to 100 Hz or less.

Perform the IF Attenuators calibration using special function 19.1. During the IF Attenuators calibration note the changes in signal level as displayed on the spectrum analyzer. During CAL0, note the signal level displayed on the analyzer. This is the reference level. During CAL1 the level should drop by 5 dB, ± .25 dB. During CAL2 the level should drop 10 dB, ± .25 dB from the reference. During CAL3 and CAL4, the level should drop 15 dB, ± .5 dB for each step.

The attenuators used for CAL1 and CAL2 are located on assembly A1A3A4. IF the changes in attenuation are not as stated above, then the problem is probably in this module.

The attenuators used for CAL3 and CAL4 are located on assembly A1A3A3. If the change in attenuation is not as described above, the problem is probably in this assembly.

5-5. REMEDY FOR ERROR MESSAGE 114

If repeating special function 15.1 does not solve the problem, check to see that the YIG local oscillator on assembly A1A3A5 is on frequency. This can be accomplished by performing the calibration procedure of Section 3, Paragraph 3-12, the D to A Converter and YIG Driver adjustment.

If the YIG local oscillator proves to be okay, then perform the 2170 MHz Second Oscillator Adjustment procedure of paragraph 3-11.

If the above two procedures check out okay, connect a spectrum analyzer, tuned to 30 MHz, to the IF output connector on the 2075 rear panel. Set the spectrum analyzer controls for 10 MHz of scan width, 300 kHz or more of bandwidth, and turn the video filters off.

Perform special function 15.1. As the FCAL is performed, and the YIG Oscillator is tuning, the IF CW signal should be seen starting at approximately 27 MHz and moving up gradually to 33 MHz. If this signal is present and is seen as described, it means that If stages are functioning correctly. Therefore, the problem is probably in the Fo Tuning circuitry, located on the A1A3A4 assembly. Check the output from the Slope Change Detector/One-Shot on the A1A3A5 Assembly. If the One-Shot output is always low during the FCAL, then the FCAL process cannot be completed.

5-6. REMEDY FOR ERROR MESSAGE 118

This error message occurs when the RF overload Detector, or its window comparators, are indicating the presence of an abnormally high RF signal in the RF Amplifier assembly, A1A3A1. If selecting a different input gain setting does not solve the problem, then there may be a failure in the RF Overload Detector circuitry on the A1A3A1 assembly. Or there may be a failure in the RF overload window comparators located on the A1A4 assembly.

5-7. REMEDY FOR ERROR MESSAGE 119

This error message occurs when the Slope Change Detector/One-Shot Amplifier on the A1A3A5 assembly has failed. It also can occur due to a failure of the Inerconnect Board A1A4. If repeated attempts to perform an FCAL do not clear the problem, then a hardware failure probably exists on one of these two assemblies. Check the output from the Slope Change Detector/One-Shot on the A1A3A5 Assembly. The One-Shot output should be low before the FCAL starts. If it is high before the FCAL starts, then the FCAL process will never begin.

5-8. REMEDY FOR ERROR MESSAGE 143

This error message occurs when the output voltage from the final detector exceeds 4.98 volts. This can be caused by an excessively high signal level at the input to the 2075 during second stage calibration. This condition can be remedied by selecting a different input gain setting using special function 16.

If this condition persists during second stage calibration when there is no external gain, a failure probably exists in either the Final Detector on the A1A3A4 assembly, or in the A to D converter on the A1A2A8 board.

5-9. REMEDY FOR ERROR MESSAGE 152

This error message indicates a failure in the RAM Assembly A1A2A2. Perform the RAM tests using the procedure of Paragraph 3-9 in Section 3. If any RAM test is not successfully passed, replace or repair the digital assembly containing the failing RAM.

5-10. REMEDY FOR ERROR MESSAGE 153

This error message indicates a failure in the ROM Assembly, A1A2A2. Perform the ROMs tests using the procedure of Paragraph 3-8 in Section 3. If any test fails, replace either the failing ROM chip, or the entire ROM board, assembly A1A2A4.

5-11. REMEDY FOR ERROR MESSAGE 154

This error message indicates a failure in the GPIB Controller Assembly. Perform steps 4 and 5 of paragraph 3-10 to check the GPIB controller. If the test does not complete successfully, replace or repair the A1A2A5 assembly.

5-12. REMEDY FOR ERROR MESSAGE 155

This error message indicates a failure in the DMAC section of the assembly. Perform steps 1 through 3 of Paragraph 3-10 to check the DMAC chip. If the test is not passed, replace the DMAC and Display RAM Assembly A1A2A6.

5-13. REMEDY FOR ERROR MESSAGE 156

This error message indicates a failure in the RAM section of the Assembly. Perform Steps 10, 11 and 12 of Paragraph 3-9 to test the Display RAM on the DMAC board. If the test fails, replace or repair the DMAC and Display RAM Assembly A1A2A6.

5-14. REMEDY FOR ERROR MESSAGE 157

This error message indicates a problem in the 16 bit A to D converter on the A/D I/O Board, A1A2A8. This A/D converter converts the output voltage from the Final Detector to a digital value which can be read by the CPU.

To test the A to D converter perform the A/D Converter Adjustment Procedure of Paragraph 3-14. If this procedure fails to remedy the problem, replace the A to D converter U8 on Assembly A1A2A8, or replace the entire assembly.

5-15. REMEDY FOR ERROR MESSAGE 158

This error message indicates a failure in the Arithmetic Processor Unit on Assembly A1A2A1. Perform steps 6 and 7 of Paragraph 3-10 to test the APU. If the APU fails the test, replace or repair the Assembly.

5-16. TROUBLESHOOTING FLOWCHART

If during Second Stage Calibration, the noise figure of the second stage appears excessively high (greater than 8.85 dB during CAL1, 13.0 dB during CAL2, or 28.0 dB during CAL3) use the flowchart of Figure 5-1 to locate and resolve the cause of the problem. The flowchart can be entered at point A in the case of high noise figure during Second Stage Calibration. It can be entered at point B if the noise figure of the 2075 is shown to be high after performing a cascade (uncorrected) noise figure measurement of the second stage.

The flow chart is useful for determining which is the failing assembly in the event of a 2075 hardware failure. Before using this flowchart, check the ENR values of the noise source in use and make sure that the correct ENR table is being used. If necessary, perform steps 1 through 19 of Paragraph 2-8.

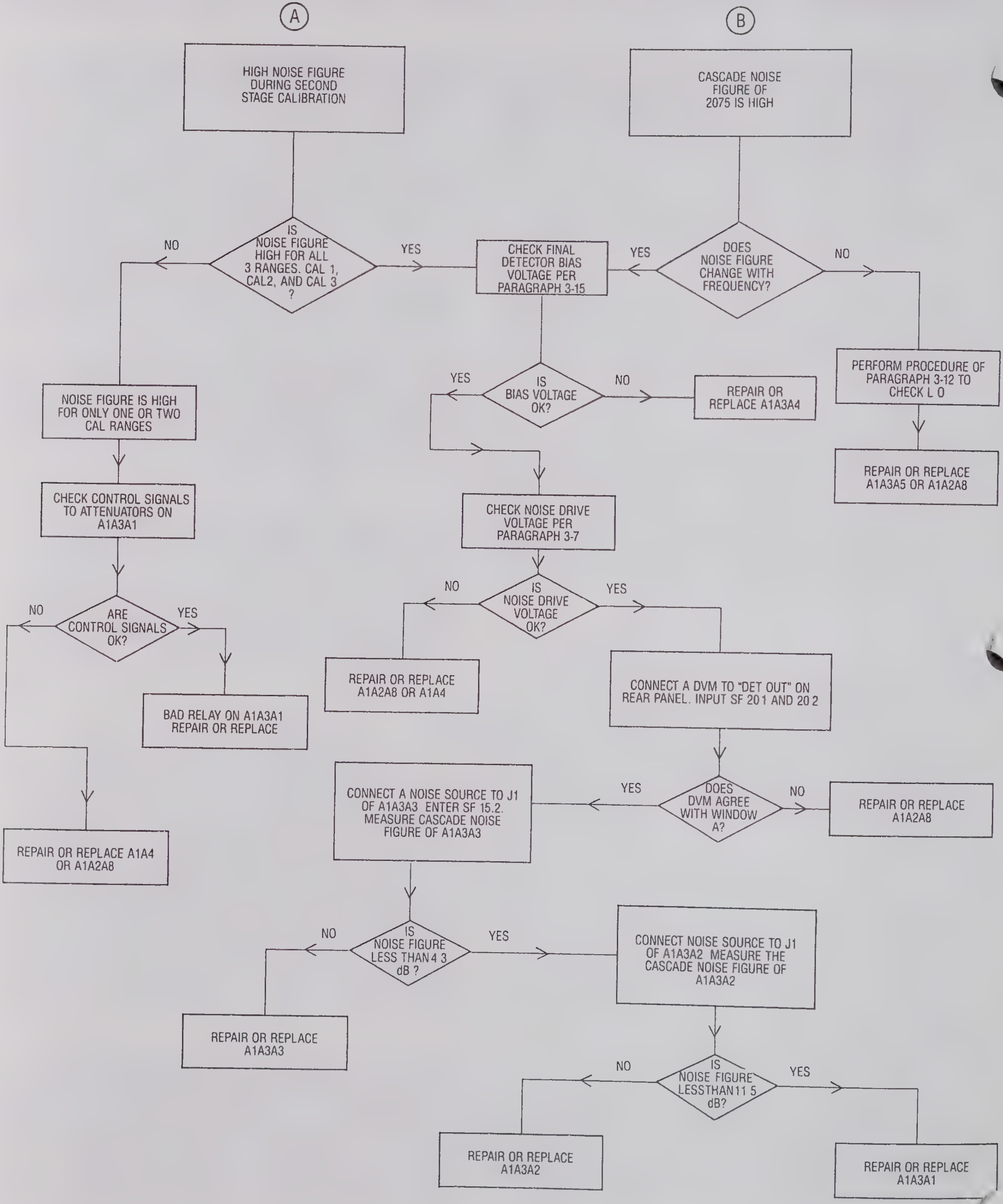

A
HIGH NOISE FIGURE DURING SECOND STAGE CALIBRATION
IS NOISE FIGURE HIGH FOR ALL 3 RANGES. CAL 1, CAL2, AND CAL 3 ?
NO
YES
NOISE FIGURE IS HIGH FOR ONLY ONE OR TWO CAL RANGES
CHECK CONTROL SIGNALS TO ATTENUATORS ON A1A3A1
ARE CONTROL SIGNALS OK?
NO
YES
BAD RELAY ON A1A3A1 REPAIR OR REPLACE
REPAIR OR REPLACE A1A4 OR A1A2A8
B
CASCADE NOISE FIGURE OF 2075 IS HIGH
DOES NOISE FIGURE CHANGE WITH FREQUENCY?
YES
NO
CHECK FINAL DETECTOR BIAS VOLTAGE PER PARAGRAPH 3-15
PERFORM PROCEDURE OF PARAGRAPH 3-12 TO CHECK L O
REPAIR OR REPLACE A1A3A5 OR A1A2A8
IS BIAS VOLTAGE OK?
YES
NO
REPAIR OR REPLACE A1A3A4
CHECK NOISE DRIVE VOLTAGE PER PARAGRAPH 3-7
IS NOISE DRIVE VOLTAGE OK?
NO
YES
REPAIR OR REPLACE A1A2A8 OR A1A4
CONNECT A DVM TO "DET OUT" ON REAR PANEL. INPUT SF 20 1 AND 20 2
DOES DVM AGREE WITH WINDOW A?
YES
NO
REPAIR OR REPLACE A1A2A8
CONNECT A NOISE SOURCE TO J1 OF A1A3A3 ENTER SF 15.2. MEASURE CASCADE NOISE FIGURE OF A1A3A3
IS NOISE FIGURE LESS THAN 4 3 dB ?
NO
YES
REPAIR OR REPLACE A1A3A3
CONNECT NOISE SOURCE TO J1 OF A1A3A2 MEASURE THE CASCADE NOISE FIGURE OF A1A3A2
IS NOISE FIGURE LESSTHAN 11 5 dB?
NO
YES
REPAIR OR REPLACE A1A3A2
REPAIR OR REPLACE A1A3A1

Figure 5-1. TROUBLESHOOTING FLOWCHART

5-17. SERVICE CENTERS

If additional information or assistance is required for servicing the 2075, contact any of the Eaton Sales and Service Centers listed below:

UNITED STATES	
Elmhurst, IL	(312) 279-8220
Los Angeles, CA	(213) 822-3061
Oakton, VA	(703) 620-5820
Sunnyvale, CA	(408) 733-6574

EUROPE	TELEPHONE	TELEX
Argenteuil, France	(1) 39-81-74-46	609036
Wokingham, United Kingdom	(0734) 794717	847238
Munich, Germany	(089) 5233023-24	529420

SECTION 6

REPLACEABLE PARTS LIST

6-1. INTRODUCTION

This section contains the replaceable parts list for the Eaton 2075 Noise-Gain Analyzer. The parts list contains the reference designator, Eaton part number, description, manufacturer's code, and manufacturer's part number for each electrical part.

6-2. LIST OF MAJOR COMPONENTS

Table 6-1 of Section 1 provides a list of major components of the 2075 Noise-Gain Analyzer. The table gives the reference designator, description and Eaton part number for each major assembly.

6-3. REPLACEABLE PARTS LIST

Table 6-2 provides a list of replaceable parts for the 2075. To order any part, preface the part designator with the designator for that assembly. For example, the full designator for capacitor C1 on the Keyboard would be A1A1A1C1.

6-4. SPARES

Table 6-3 provides a listing of recommended spare parts that should be maintained as a minimum stock of replacement parts.

Table 6-1. 2075 Noise-Gain Analyzer List of Major Components

Assembly		Eaton Part Number
A1	Final Unit Assembly, 2075	4-006340-00X
A1A1	Front Panel Assembly	4-006426-001
A1A1A1	PWBA, Keyboard	4-006346-001
A1A1A2	PWBA, Display	4-006345-001
A1A2	Digital Section (Plug in PCBs)	
A1A2A1	PWBA, Front Panel I/O, APU	4-006343-001
A1A2A2	PWBA, RAM/Battery Back up RAM	4-006344-001
A1A2A3	PWBA, CPU	4-006659-001
A1A2A4	PWBA, ROM	4-006540-001
A1A2A5	PWBA, GPIB I/O	4-006400-001
A1A2A6	PWBA, DMAC RAM, (Scope Output)	4-006341-001
A1A2A7	PWBA, Scope Driver	4-006342-001
A1A2A8	PWBA, Analog/Digital I/O (AD, DA's)	4-006347-001
A1A2A9	PWBA, Mother Board	4-006417-001
A1A3	RF Section	
A1A3A1	RF Front End Amplifier Assembly	4-006418-001
A1A3A2	Second Converter Assembly	4-006419-001
A1A3A3	First 30 MHz IF, Preamplifier Assembly	4-006420-001
A1A3A4	Second 30 MHz IF, Detector Assembly	4-006421-001
A1A3A5	First LO YIG Driver Assembly	4-006422-001
A1A4	PWBA Interconnect Board	4-006415-001
A1A5	Rear Panel Assembly	4-006462-001

Table 6-2. Replaceable Parts List For Model 2075 A1A1 Front Panel Assembly

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A1

An example of a complete Reference Designator is:

A1A1A1

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
	4-203142-001	Panel, Front		
A1	4-006346-001	PWBA, Keyboard	88869	
A2	4-006345-001	PWBA, Display	88869	

PARTS LIST FOR MODEL 2075 A1A1A1

PWBA KEYBOARD

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A1A1

An example of a complete Reference Designator is:

A1A1A1R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900039-007	Capacitor, Electrolytic 4.7 μF, 16 V dc	09023	NLW5-16
C2	1-900126-002	Capacitor, Ceramic 0.33 μF, ± 10%, 50 Vdc	IND STD	CKO6BX334K
C3	1-900072-041	Capacitor, Mica 1000 pF, ± 5%, 100 Vdc	14655	CD7FA102J03
C4	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C5	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C6	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C7	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C8	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C9	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
DS1	1-925033-001	Display LED (10 Bar Graph)	50522	MV57164
J1	1-910443-007	Connector, Rectangle 30 contacts	00779	102154-7
R1	1-945027-339	Resistor, Film 33.2 k ohms, ± 1%, 1/4 W	IND STD	RN55D3322F
R2	1-945027-339	Resistor, Film 33.2 k ohms, ± 1%, 1/4 W	IND STD	RN55D3322F
R3	1-945027-289	Resistor, Film 10 k ohms, ± 1%, 1/4 W	IND STD	RN55D1002F
R4	1-945027-289	Resistor, Film 10 k ohms, ± 1%, 1/4 W	IND STD	RN55D1002F
R5	1-945027-161	Resistor, Film 464 ohms, ± 1%, 1/4 W	IND STD	RN55D4640F
R6	1-945027-289	Resistor, Film 10 k ohms, ± 1%, 1/4 W	IND STD	RN55D1002F
R7	1-945027-289	Resistor, Film 10 k ohms, ± 1%, 1/4 W	IND STD	RN55D1002F
R8	1-945027-273	Resistor, Film 6.81 k ohms, ± 1%, 1/4 W	IND STD	RN55D6811F
R9	1-945170-222	Resistor, Film, Network (8) 22 k ohms, ± 2%, 1/8 W	01121	316B223
R10	1-945170-217	Resistor, Film, Network (8) 4.7 k ohms, ± 2%, 1/4 W	01121	316B472472
R11	1-945027-273	Resistor, Film 6.81 k ohms, ± 1%, 1/4 W	IND STD	RN55D6811F
R12	1-945170-207	Resistor, Film, Network (8) 150 ohms, ± 5%, 1/8 W	01121	316B1513-R150
R13	1-945170-207	Resistor, Film, Network (8) 150 ohms, ± 5%, 1/8 W	01121	316B151
S1	1-404678-001	Switch, Push PRESET	88869	
S2	1-404678-002	Switch, Push SPFN	88869	
S3	1-404678-003	Switch, Push SHIFT	88869	
S4	1-404678-004	Switch, Push LOCAL	88869	
S5	1-404678-005	Switch, Push Upper Limit	88869	
S6	1-404678-006	Switch, Push Lower Limit	88869	
S7	1-404678-007	Switch, Push Start Freq	88869	
S8	1-404678-008	Switch, Push Stop Freq	88869	

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
S9	1-404678-009	Switch, Push SWEEP	88869	
S10	1-404678-010	Switch, Push Step Size	88869	
S11	1-404678-011	Switch, Push Fixed Freq	88869	
S12	1-404678-012	Switch, Push	88869	
S13	1-404678-013	Switch, Push	88869	
S14	1-404678-014	Switch, Push ENR	88869	
S15	1-404678-015	Switch, Push ON/OFF	88869	
S16	1-404678-016	Switch, Push SEQ	88869	
S17	1-404678-017	Switch, Push STORE	88869	
S18	1-404678-018	Switch, Push RECALL	88869	
S19	1-404678-019	Switch, Push –	88869	
S20	1-404678-020	Switch, Push .	88869	
S21	1-404678-021	Switch, Push 0	88869	
S22	1-404678-022	Switch, Push 7	88869	
S23	1-404678-023	Switch, Push 4	88869	
S24	1-404678-024	Switch, Push 1	88869	
S25	1-404678-025	Switch, Push 8	88869	
S26	1-404678-026	Switch, Push 5	88869	
S27	1-404678-027	Switch, Push 2	88869	
S28	1-404678-028	Switch, Push 9	88869	
S29	1-404678-029	Switch, Push 6	88869	
S30	1-404678-030	Switch, Push 3	88869	
S31	1-404678-031	Switch, Push RATIO/dB	88869	
S32	1-404678-032	Switch, Push CLEAR	88869	
S33	1-404678-033	Switch, Push ENTER	88869	
S34	1-404678-034	Switch, Push F+G	88869	
S35	1-404678-035	Switch, Push F	88869	
S36	1-404678-036	Switch, Push CALIB	88869	
S37	1-404678-037	Switch, Push	88869	
S38	1-404678-038	Switch, Push	88869	
S39	1-404678-039	Switch, Push RATIO/dB	88869	
U1	1-926081-072	Integrated Circuit, Dual Decoder	IND STD	74LS156
U2	1-926081-073	Integrated Circuit, TTL Octal Driver	IND STD	74LS244
U3	1-926081-028	Integrated Circuit, TTL Dual D Flip-Flop	IND STD	74LS74

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
U4	1-926087-001	Integrated Circuit, TTL Quad Computer	IND STD	LM339
U5	1-926081-076	Integrated Circuit, TTL Octal D Flip-Flop	IND STD	74LS377
U6	1-926081-076	Integrated Circuit, TTL Octal D Flip-Flop	IND STD	74LS377

PARTS LISTS FOR MODEL 2075 A1A1A2

PWBA DISPLAY BOARD

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A1A2

An example of a complete Reference Designator is:

A1A1A2R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C2	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C3	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 10 Vdc	IND STD	CK05BX104K
C4	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C5	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C6	1-900039-007	Capacitor, Electrolytic 4.7 μF, 16 Vdc	09023	NLW5-16
C7	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
DS1	1-925032-001	Display, Bar Graph (LED)	50434	HLMP2620
DS2	1-925032-001	Display, Bar Graph (LED)	50434	HLMP2620
DS3	1-925029-101	7 Segment LED Display	50434	HP5082-7611
DS4	1-925029-101	7 Segment LED Display	50434	HP5082-7611
DS5	1-925029-101	7 Segment LED Display	50434	5082-7611
DS6	1-925029-101	7 Segment LED Display	50434	5082-7611
DS7	1-925032-001	Display, Bar Graph (LED)	50434	HLMP2620
DS8	1-925032-001	Display, Bar Graph (LED)	50434	HLMP2620
DS9	1-925029-101	7 Segment LED Display	50434	HP5082-7611

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
DS10	1-925029-101	7 Segment LED Display	50434	HP5082-7611
DS11	1-925029-101	7 Segment LED Display	50434	HP5082-7611
DS12	1-925029-101	7 Segment LED Display	50434	HP5082-7611
DS13	1-925032-001	Display, Bar Graph (LED)	50434	HLMP2620
DS14	1-925029-101	7 Segment LED Display	50434	HP5082-7611
DS15	1-925029-101	7 Segment LED Display	50434	HP5082-7611
DS16	1-925029-101	7 Segment LED Display	50434	HP5082-7611
DS17	1-925029-101	7 Segment LED Display	50434	HP5082-7611
DS18	1-925029-101	7 Segment LED Display	50434	HP5082-7611
DS19	1-925032-001	Display, Bar Graph (LED)	50434	HLMP2620
J1	1-910443-007	Connector, Rectangular, 30 Contacts	00779 00779	102154-7 102312-2
M1	4-404675-001	Meter, Panel, 5 mA	88869	
M2	4-404675-001	Meter, Panel, 5 mA	88869	
R1	1-945170-207	Resistor, Film, Network 150 ohms, 2%, 1/8 W	01121	316B151
R2	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R3	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R4	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R5	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R6	1-945170-207	Resistor, Film, Network 150 ohms, 2%, 1/8 W	01121	316B151
R7	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R8	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R9	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R10	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R11	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R12	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R13	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R14	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W Ref.	01121	316B471
R15	1-945170-211	Resistor, Film, Network 470 ohms, 2%, 1/8 W	01121	316B471
R16	1-945170-207	Resistor, Film, Network 159 ohms, 2%, 1/8 W	01121	316B151
U1	1-926081-076	Integrated Circuit, Octal D Flip-Flop	IND STD	74LS377N
U2	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U3	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U4	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U5	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U6	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U7	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U8	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U9	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U10	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U11	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U12	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U13	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U14	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U15	1-926081-076	Integrated Circuit, LS, TTL Octal D Flip-Flop	IND STD	74LS377N
U16	1-926081-076	Integrated Circuit, LS, TTL Decoder	IND STD	74LS377N
U17	1-926081-071	Integrated Circuit, LS, TTL Decoder	IND STD	74LS154N
U18	1-926081-040	Integrated Circuit, LS, TTL	IND STD	74LS138N

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
XU1	1-950020-104	Sockets, IC, 16 contacts	52072	CA-16S-10SD
XU2	1-950020-104	Sockets, IC, 16 contacts	52072	CA-16S-10SD
XU3	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU4	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU5	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU6	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU7	1-950020-104	Sockets, IC, 16 contacts	52072	CA-16S-10SD
XU8	1-950020-104	Sockets, IC, 16 contacts	52072	CA-16S-10SD
XU9	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU10	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU11	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU12	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU13	1-950020-104	Sockets, IC, 16 contacts	52072	CA-16S-10SD
XU14	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU15	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU16	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU17	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU18	1-950020-102	Sockets, IC, 14 contacts	52072	CA-14S-10SD
XU19	1-950020-104	Sockets, IC, 16 contacts	52072	CA-16S-10SD

PARTS LIST FOR MODEL 2075 A1A2A1

PWBA FRONT PANEL INTERFACE AND APU

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A2A1

An example of a complete Reference Designator is:

A1A2A1R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900039-007	Capacitor, Electrolytic 4.7 μF, ± 16 Vdc	09023	NLW5-16
C2	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C3	1-900115-007	Capacitor, Electrolytic 10 μF, 20 Vdc	56289	196D106X0020JA1

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C4	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C5	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C6	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C7	1-900115-007	Capacitor, Electrolytic 10 µF, 20 Vdc	56289	196D106X0020JA1
C8	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C9	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C10	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C11	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C12	1-900039-007	Capacitor, Electrolytic 4.7 µF, 16 Vdc	09023	NLW5-16
C13	1-900098-031	Capacitor, Mica 100 pF, ± 5%, 300 Vdc	IND STD	DM5-101
C14	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C15	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C16	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C17		NOT USED		
C18	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, Vdc	IND STD	CK05BX104K
C19	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, Vdc	IND STD	CK05BX104K
C20	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C21	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C22	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
CR1	1-913020-013	Diode, Zener 10 Vdc, 1 W	04713	1N4740
J1	1-910362-311	Connector, Rectangle 30 contacts	00779	102160-7
R1	1-945000-182	Resistor, Composition 6.8 k ohms, ± 5%, 1/4 W	01121	CB6825

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R2	1-945000-186	Resistor, Composition 10 k ohms, ±5%, 1/4 W	01121	CB1025
R3	1-945000-155	Resistor, Composition 510 ohms, ±5%, 1/4 W	01121	CB5115
U1	1-926081-074	Integrated Circuit Octal BUS Transceiver	IND STD	74LS245N
U2	1-926217-001	Integrated Circuit Processor	34335	AM9511ADC
U3	1-926081-040	Integrated Circuit Decoder	IND STD	74LS138
U4	1-926149-012	Integrated Circuit BUS Buffer	IND STD	8T97
U5	1-926127-004	Integrated Circuit 12V Regulator	IND STD	7812
U6	1-926081-001	Integrated Circuit Quad NAND gate	IND STD	74LS00
U7	1-926149-012	Integrated Circuit BUS Buffer	IND STD	8T97
U8	1-926081-063	Integrated Circuit Dual Multivibrator	IND STD	74LS123
U9	1-926081-013	Integrated Circuit Dual AND Gate	IND STD	74LS21
U10	1-926081-028	Integrated Circuit Dual D Flip-Flop	IND STD	74LS74
U11	1-926081-019	Integrated Circuit Quad OR Gate	IND STD	74LS32
U12	1-926081-005	Integrated Circuit HEX Inverter	IND STD	74LS04
U13	1-926081-074	Integrated Circuit Octal BUS Transceiver	IND STD	74LS245
U14	1-926215-002	Integrated Circuit Dual D-A Converter	24355	AD7528JN
U15	1-926126-001	Integrated Circuit, Quad Op-Amplifier	04713	LM324N
XU1		NOT USED		
XU2	1-950020-006	Socket, IC, 24 contacts	00779	640361-3
XU3		NOT USED		
XU4		NOT USED		
XU5		NOT USED		
XU6		NOT USED		
XU7		NOT USED		
XU8		NOT USED		

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
XU9		NOT USED		
XU10		NOT USED		
XU11		NOT USED		
XU12		NOT USED		
XU13		NOT USED		
XU14	1-950020-014	Socket, IC, 20 contacts	00779	640464-3

PARTS LIST FOR MODEL 2075 A1A2A2

PWBA BACKUP RAM CARD

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A2A2

An example of a complete Reference Designator is:

A1A2A2R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
BT1	905004-001	Battery, Rechargeable, Nicad, 1.2 V @ 180 mAH	0000A	1N180AAAS
BT2	905004-001	Battery, Rechargeable, Nicad, 1.2 V @ 180 mAH	0000A	1N180AAAS
BT3	905004-001	Battery, Rechargeable, Nicad, 1.2 V @ 180 mAH	0000A	1N180AAAS
C1	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C2	1-900039-007	Capacitor, Electrolytic 4.7 μF, 16 Vdc	09023	NLW5-16
C3	1-900039-004	Capacitor, Electrolytic 100 μF, 25 Vdc	09023	NLW100-25
C4		NOT USED		
C5	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C6	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C7	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C8	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C9	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C10	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C11	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C12	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C13	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
CR1	1-913020-002	Diode, Zener 3.6 Vdc, 1 W	04713	1N4729
Q1	1-958117-002	Transistor, Silicon, NPN	04713	MPSA14
Q2	1-958000-002	Transistor, Silicon, PNP	04713	2N3906
Q3	1-958000-001	Transistor, Silicon, NPN	04713	2N3904
R1	1-945000-227	Resistor, Composition 510 k ohms, ± 5%, 1/4 W	01121	CB5145
R2	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R3	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R4	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R5	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R6	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R7	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R8	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R9	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R10	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R11	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
U1		NOT USED		
U2	1-926149-012	Integrated Circuit BUS Buffer	IND STD	8T97
U3	1-926149-012	Integrated Circuit BUS Buffer	IND STD	8T97

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
U4	1-926081-072	Integrated Circuit Dual Decoder	IND STD	74LS156
U5	1-926007-032	Integrated Circuit Quad OR Gate	IND STD	7432
U6	1-926081-013	Integrated Circuit Dual AND Gate	IND STD	74LS21
U7	1-926212-001	Integrated Circuit, CMOS Static RAM	04713	MCM61L16P200
U8	1-926212-001	Integrated Circuit, CMOS Static, RAM	04713	MCM61L16P20
U9	1-926212-001	Integrated Circuit, CMOS Static RAM	04713	MCM61L16P20
XU1		NOT USED		
XU2		NOT USED		
XU3		NOT USED		
XU4		NOT USED		
XU5		NOT USED		
XU6		NOT USED		
XU7	1-950020-006	Socket, IC, 24 contacts	00779	640361-3
XU8	1-950020-006	Socket, IC, 24 contacts	00779	640361-3
XU9	1-950020-006	Socket, IC, 24 contacts	00779	640361-3
XU10	1-950020-006	Socket, IC, 24 contacts	00779	640361-3

PARTS LIST FOR MODEL 2075 A1A2A3

PWBA MICROPROCESSOR

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A2A3

An example of a complete Reference Designator is:

A1A2A3R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
	1-998482-001	PWBA Microprocessor		
C1	1-900039-007	CAP, 4.7 μF 16V Lytic		
C2	1-900039-007	CAP, .1 μF Ceramic		
C3	1-900039-007	CAP, .1 μF Ceramic		

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C4	1-900039-007	CAP, .1 µF Ceramic		
C5	1-900039-007	CAP, .1 µF Ceramic		
C6	1-900039-007	CAP, .1 µF Ceramic		
C7	1-900039-007	CAP, .1 µF Ceramic		
C8	1-900039-007	CAP, .1 µF Ceramic		
C9	1-900039-007	CAP, .1 µF Ceramic		
C10	1-900039-007	CAP, .1 µF Ceramic		
C11	1-900039-007	CAP, .1 µF Ceramic		
C12	1-900115-011	CAP 10 µF Tantalum		
C13	1-900115-011	CAP 10 µF Tantalum		
C14	1-900122-049	CAP, .1 µF Ceramic		
C15	1-900122-049	CAP, .1 µF Ceramic		
C16	1-900122-049	CAP, .1 µF Ceramic		
R1	1-945208-219	RES SIP 4.7K 10 PINS		
R2	1-945208-219	RES SIP 4.7K 10 PINS		
R3	1-945208-219	RES SIP 4.7K 10 PINS		
R4	1-945208-219	RES SIP 4.7K 10 PINS		
R5	1-945027-357	RES 51.1K 1%		
R6	1-945027-357	RES 51.1K 1%		
U1	1-926081-074	IC		74LS245
U2	1-926081-073	IC		74LS244
U3	1-926081-073	IC		74LS244
U4	1-926081-073	IC		74LS244
U5	1-926212-001	IC 6116 COMS, RAMS		
U6	1-926212-001	IC 6116 COMS, RAMS		
U7	1-926081-012	IC		74LS20
U8	1-926081-005	IC		74LS04
U9	1-926081-028	IC		74LS74
U10	1-926167-001	IC		MC6808P
U11	1-926081-007	IC		74LS08
U12	1-926081-001	IC		74LS00
U13	1-998560-001	HYBRID OSC 4 MHz		
U14	1-926081-040	IC		74LS188
U15	1-926110-001	IC		NE555
XU5	1-950020-006	IC SOCKET, 24 Pin		
XU6	1-950020-006	IC SOCKET, 24 Pin		
XU10	1-950020-022	IC SOCKET, 40 Pin		
XU13	1-950020-002	IC SOCKET, 14 Pin		

PARTS LIST FOR MODEL 2075 A1A2A4

PWBA 64 K ROM CARD

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A2A4

An example of a complete Reference Designator is:

A1A2A4R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900039-007	Capacitor, Electrolytic 4.7 μF, 16 Vdc	09023	NLW5-16
C2	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C3	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C4	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C5	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C6	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C7	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C8	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C9	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C10	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C11	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
U1	1-926081-073	Integrated Circuit Octal Driver	IND STD	74LS244
U2	1-926149-012	Integrated Circuit BUS Buffer	IND STD	8T97
U3	1-926081-040	Integrated Circuit Decoder	IND STD	74LS138
U4	1-926081-019	Integrated Circuit Quad OR Gate	IND STD	74LS32
U5		NOT USED		
U6		NOT USED		

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
U7*	1-404681-001	Integrated Circuit Programmed EPROM	88869	
U8*	1-404681-002	Integrated Circuit Programmed EPROM	88869	
U9*	1-404681-003	Integrated Circuit Programmed EPROM	88869	
U10*	1-404681-004	Integrated Circuit Programmed EPROM	88869	
U11*	1-404681-005	Integrated Circuit Programmed EPROM	88869	
U12		NOT USED		
XU1		NOT USED		
XU2		NOT USED		
XU3		NOT USED		
XU4		NOT USED		
XU5	1-950020-018	Socket, IC, 28 contacts	00779	640362-3
XU6	1-950020-018	Socket, IC, 28 contacts	00779	640362-3
XU7	1-950020-018	Socket, IC, 28 contacts	00779	640362-3
XU8	1-950020-018	Socket, IC, 28 contacts	00779	640362-3
XU9	1-950020-018	Socket, IC, 28 contacts	00779	640362-3
XU10	1-950020-018	Socket, IC, 28 contacts	00779	640362-3
XU11	1-950020-018	Socket, IC, 28 contacts	00779	640362-3
XU12	1-950020-018	Socket, IC, 28 contacts	00779	640362-3

*Note: U7 thru U11 and ROM 0 thru ROM 3 (A1A2A3) are part of the PROGRAMMED EPROM SET 1-006541-001

PARTS LIST FOR MODEL 2075 A1A2A5

PWBA GPIB CARD

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with: A1A2A5

An example of a complete Reference Designator is:

A1A2A5R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900039-007	Capacitor, Electroltyic 4.7 μF, 16 Vdc	09023	NLW5-16
C2	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C3	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C4	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C5	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C6	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C7	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C8	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
J1	1-910362-310	Connector, PC Board 24 contacts	00779	102160-5
R1	1-945169-025	Resistor, Film, Network 10 k ohms, ± 2%, 0.2 W	80740	783-1-10K
S1	1-951053-005	Switch, DIP, 5 X SPSP	00779	435640-3
U1	1-926149-012	Integrated Circuit BUS Buffer	IND STD	8T97
U2	1-926081-040	Integrated Circuit Decoder	IND STD	74LS138
U3	1-926081-074	Integrated Circuit Octal Transceiver	IND STD	74LS245
U4	1-926081-077	Integrated Circuit Quad D Flip-Flop	IND STD	74LS379
U5	1-926149-012	Integrated Circuit BUS Buffer	IND STD	8T97
U6	1-926081-005	Integrated Circuit Hex Inverter	IND STD	75LS04
U7	1-926149-007	Integrated Circuit Interface Adapter	04713	MC68488
U8	1-926149-006	Integrated Circuit Quad Transceiver	04713	MC3448
U9	1-926149-006	Integrated Circuit Quad Transceiver	04713	MC3448
U10	1-926081-019	Integrated Circuit Quad OR Gate	IND STD	74LS32
U11	1-926149-006	Integrated Circuit Quad Transceiver	04713	MC3448
U12	1-926149-006	Integrated Circuit Quad Transceiver	04713	MC3448
XU1		NOT USED		

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
XU2		NOT USED		
XU3		NOT USED		
XU4		NOT USED		
XU5		NOT USED		
XU6		NOT USED		
XU7	1-950020-022	Socket, IC, 40 contacts	00779	640379-3

PARTS LIST FOR MODEL 2075 A1A2A6

PWBA DMAC AND SCOPE RAM CARD

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with: A1A2A6

An example of a complete Reference Designator is:

A1A2A6R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900039-007	Capacitor, Electrolytic 4.7 µF, 16 Vdc	09023	NLW5-16
C2	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C3	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C4	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C5	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C6	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C7	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C8	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C9	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C10	1-900098-022	Capacitor, Mica 47 pF, ± 5%, 300 Vdc	IND STD	DM5-470
J1	1-950020-004	Socket, DIP, 16 contacts	00779	640358-3
R1	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R2	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R3	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R4	1-9450081-010	Resistor, Variable, Cermet 10 k ohms, ± 10%, 3/4 W	80294	3009P-1-103
R5	1-945027-261	Resistor, Film 5.11 k ohms, ± 1%, 1/4 W	IND STD	RN55D5111F
R6	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R7	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
U1	1-926081-074	Integrated Circuit, Octal Transceiver	IND STD	74LS245
U2	1-926149-012	Integrated Circuit, BUS Buffer	IND STD	8T97
U3	1-926149-012	Integrated Circuit, BUS Buffer	IND STD	8T97
U4	1-926081-040	Integrated Circuit, Decoder	IND STD	74LS138
U5	1-926081-019	Integrated Circuit, Quad OR Gate	IND STD	74LS32
U6	1-926213-001	Integrated Circuit, DMA Controller	04713	MC6844P
U7	1-926169-004	Integrated Circuit, Static RAM	04713	MCM21L14P-30
U8	1-926169-004	Integrated Circuit, Static RAM	IND STD	MCM21L14P-30
U9	1-926081-007	Integrated Circuit, Quad AND Gate	IND STD	74LS08
U10	1-926081-005	Integrated Circuit, Hex Inverter	IND STD	74LS04
U11	1-926081-028	Integrated Circuit, Dual D Flip-Flop	IND STD	74LS74
U12	1-926081-001	Integrated Circuit, Quad NAND Gate	IND STD	74LS00
U13	1-926081-063	Integrated Circuit, Dual Multivibrator	IND STD	74LS123
U14	1-926081-075	Integrated Circuit, Binary Counter	IND STD	74LS293
U15	1-926081-077	Integrated Circuit, Quad D Flip-Flop	IND STD	74LS379
XU1		NOT USED		

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
XU2		NOT USED		
XU3		NOT USED		
XU4		NOT USED		
XU5		NOT USED		
XU6	1-950020-022	Socket, IC 40 Contacts	00779	640379-3
XU7	1-950020-012	Socket, IC 18 Contacts	00779	640359-3
XU8	1-950020-012	Socket, IC 18 Contacts	00779	640359-3

PARTS LIST FOR MODEL 2075 A1A2A7

PWBA SCOPE DRIVER CIRCUIT

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A2A7

An example of a complete Reference Designator is:

A1A2A7R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900039-007	Capacitor, Electrolytic 4.7 μF, 16 Vdc	09023	NLW5-16
C2	1-900039-007	Capacitor, Electrolytic 4.7 μF, 16 Vdc	09023	NLW5-16
C3	1-900039-007	Capacitor, Electrolytic 4.7 μF, 16 Vdc	09023	MLW5-16
C4	1-900072-041	Capacitor, Mica 1000 pF, ± 5%, 100 Vdc	14655	CD7FA102JO3
C5	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C6	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C7	1-900072-041	Capacitor, Mica 1000 pF, ± 5%, 100 Vdc	14655	CD7FA102JO3
C8	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C9	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C10	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C11	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C12	1-900003-099	Capacitor, Mica	IND STD	DM15F102F0100WV
C13	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C14	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C15	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C16	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C17	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C18	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C19	1-900003-099	Capacitor, Mica 1000 pF, ± 1%, 100 Vdc	IND STD	DM15F102F0100WV
C20	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C21	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C22	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C23	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C24	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C25	1-900098-016	Capacitor, Mica 27 pF ± 5%, 300 Vdc	IND STD	DM5EC270J
C26	1-900098-031	Capacitor, Mica 100 pF ± 5%, 300 Vdc	IND STD	DM5FC101J
C27	1-900072-041	Capacitor, Mica 1000 pF, ± 5%, 100 Vdc	14655	CD7FA102J03
C28	1-900072-041	Capacitor, Mica 1000 pF, ± 5%, 100 Vdc	14655	CD7FA102J03
C29	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C30	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C31	1-900098-016	Capacitor, Mica 27 pF ± 5%, 300 Vdc	IND STD	DM5EC270J
C32	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C33	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C34	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C35	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C36	1-900122-049	Capacitor, Ceramic 0.1 µF, ± 10%, 50 Vdc	IND STD	CK05BX104K
CR1	1-913020-008	Diode, Zener 6.2 Vdc, 1 W	04713	1N4735
J1	1-950020-004	Socket, DIP, 16 contacts	00779	640358-3
J2	1-910442-002	Connector, Right Angle 8 Contacts	00779	640457-8
Q1	1-958000-001	Transistor, Silicon, NPN	IND STD	2N3904
R1	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R2	1-945000-164	Resistor, Composition 1.2 k ohms, ± 5%, 1/4 W	01121	CB1225
R3	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R4	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R5	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R6	1-945000-164	Resistor, Composition 1.2 k ohms, ± 5%, 1/4 W	01121	CB1225
R7	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R8	1-945000-167	Resistor, Composition 1.6 k ohms, ± 5%, 1/4 W	01121	CB1625
R9	1-945000-174	Resistor, Composition 3.3 k ohms, ± 5%, 1/4 W	01121	CB3325
R10	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R11	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R12	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R13	1-945027-341	Resistor, Film 34.8 k ohms, ± 1%, 1/4 W	IND STD	RN55D3482F
R14	1-945081-011	Resistor, Variable 20 k ohms, ± 10%, 3/4 W	80294	3009P-1-203
R15		NOT USED		
R16		NOT USED		

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R17	1-945000-182	Resistor, Composition 6.8 k ohms, ±5%, 1/4 W	01121	CB6825
R18	1-945000-164	Resistor, Composition 1.2 k ohms, ±5%, 1/4 W	01121	CB1225
R19	1-945000-204	Resistor, Composition 56 k ohms, ±5%, 1/4 W	01121	CB5635
R20	1-945000-186	Resistor, Composition 10 k ohms, ±5%, 1/4 W	01121	CB1035
R21	1-945000-130	Resistor, Composition 47 ohms, ±5%, 1/4 W	01121	CB4705
R22	1-945000-130	Resistor, Composition 47 ohms, ±5%, 1/4 W	01121	CB4705
R23	1-945000-130	Resistor, Composition 47 ohms, ±5%, 1/4 W	01121	CB4705
U1	1-926172-001	Integrated Circuit S/H Amplifier	24355	AD583K
U2	1-926081-009	Integrated Circuit Triple NAND Gate	IND STD	74LS10
U3	1-926081-028	Integrated Circuit Dual D Flip-Flop	IND STD	74LS74
U4	1-926081-019	Integrated Circuit Quad OR Gate	IND STD	74LS32
U5	1-926172-001	Integrated Circuit S/H Amplifier	24355	AD583K
U6	1-926156-001	Integrated Circuit JFET Amplifier	04713	LF356H
U7	1-926098-001	Integrated Circuit Op-Amplifier	18324	μA741
U8	1-926064-003	Integrated Circuit Comparator	04713	LM311N
U9	1-926098-001	Integrated Circuit Op-Amplifier	18324	uA741
U10	1-926156-001	Integrated Circuit JFET Amplifier	04713	LF356H
U11	1-926156-001	Integrated Circuit JFET Amplifier	04713	LF356H
U12	1-926081-063	Integrated Circuit Dual Multivibrator	IND STD	74LS123
U13	1-926081-005	Integrated Circuit Hex Inverter	IND STD	74LS04
U14	1-926156-001	Integrated Circuit JFET Amplifier	04713	LF356H

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
U15	1-926081-018	Integrated Circuit NAND Gate	IND STD	74LS30
U16	1-926215-001	Integrated Circuit D-A Converter	24355	AD7524JN
U17	1-926081-076	Integrated Circuit Octal D Flip-Flop	IND STD	74LS377
U18	1-926081-076	Integrated Circuit Octal D Flip-Flop	IND STD	74LS377
U19	1-926215-001	Integrated Circuit, DAC, CMOS D-A Converter	24355	AD7524JN
XU1		NOT USED		
XU2		NOT USED		
XU3		NOT USED		
XU4		NOT USED		
XU5		NOT USED		
XU6		NOT USED		
XU7		NOT USED		
XU9		NOT USED		
XU10		NOT USED		
XU11		NOT USED		
XU12		NOT USED		
XU13		NOT USED		
XU14		NOT USED		
XU15		NOT USED		
XU16	1-950020-004	Socket, IC, 16 Contacts	00779	640358-3
XU17		NOT USED		
XU18		NOT USED		
XU19	1-950020-004	Socket, IC, 16 Contacts	00779	640358-3

PARTS LIST FOR MODEL 2075 A1A2A8

PWBA AD/DA CONVERTER CARD

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A2A8

An example of a complete Reference Designator is:

A1A2A8R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900039-007	Capacitor, Electrolytic 4.7 μF, 16 Vdc	09023	NLW5-16
C2	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C3	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C4	1-900039-007	Capacitor, Electrolytic 4.7 μF, 16 Vdc	09023	NLW5-16
C5	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C6	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C7	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C8	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C9	1-900039-007	Capacitor, Electrolytic 4.7 μF, 16 Vdc	09023	NLW5-16
C10	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C11	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C12	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C13	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C14	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C15	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C16	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C17	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C18	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C19	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C20	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C21	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C22	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C23	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C24	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C25	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C26	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C27	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C28	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C29	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
CR1	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
J1	1-910377-001	Connector, RF, SMB	98291	51-053-0000
J2	1-910377-001	Connector, RF, SMB	98291	51-053-0000
J3	1-910362-310	Connector, Right Angle 24 contacts	00779	102160-5
Q1	1-958000-001	Transistor, Silicon, PNP	IND STD	2N3906
Q2	1-958000-002	Transistor, Silicon, NPN	IND STD	2N3904
R1	1-945081-007	Resistor, Variable, Cermet 1 k ohms, ± 10%, 3/4 W	80294	3009P-1-102
R2	1-945081-007	Resistor, Trimpot 1 k ohms, ± 10%, 3/4 W	80294	3009P-1-102
R3	1-945081-011	Resistor, Trimpot 20 k ohms, ± 10%, 3/4 W	80294	3009P-1-203
R4	1-945081-003	Resistor, Varialbe, Cermet 50 ohms, ± 10%, 3/4 W	80294	3009P-1-500
R5	1-945167-300	Resistor, Wirewound 10 k ohms, ± 1/2%, 0.1 W	34238	MR500-6A-10.0K-0.5%

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R6	1-945167-441	Resistor, Wirewound 169 ohms, ± 1/2%, 0.1 W	34238	MR500-6A-169-0.5%
R7	1-945167-300	Resistor, Wirewound 10 k ohms, ± 1/2%, 0.1 W	34238	MR500-6A-10.0K-0.5%
R8	1-945167-324	Resistor, Wirewound 13.3 k ohms, ± 1/2%, 1/4 W	34238	MR500-6A-13.3K-0.5%
R9	1-945167-316	Resistor, Wirewound 12.1 ohms, ± 1/2%, 1/4 W	34238	MR500-6A-12.1K-0.5%
R10	1-945027-097	Resistor, Film 100 ohms, ± 1%, 1/4 W	IND STD	RN55D1000F
R11	1-945016-710	Resistor, Film 4.02 k ohms, ± 1/2%, 0.1 W	34238	MR500-6A-4.02K-0.5%
R12	1-945167-316	Resistor, Film 12.1 ohms, ± 1/2%, 0.1 W	34238	MR500-6A-12.1K-0.5%
R13	1-945027-379	Resistor, Film 86.6 k ohms, ± 1%, 1/4 W	IND STD	RN55D8662F
R14	1-945000-173	Resistor, Composition 3 k ohms, ± 5%, 1/4 W	01121	CB3025
R15	1-945000-194	Resistor, Composition 22 k ohms, ± 5%, 1/4 W	01121	CB2235
R16	1-945000-179	Resistor, Composition 5.1 k ohms, ± 5%, 1/4 W	01121	CB5125
R17	1-945081-008	Resistor, Variable, Cermet 2 k ohms, ± 10%, 3/4 W	80294	3009P-1-202
R18	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R19	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R20	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R21	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R22	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R23	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R24	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R25	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
U1	1-926141-001	Integrated Circuit Op-Amplifier	07263	μA714HC

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
U2	1-926141-001	Integrated Circuit Op-Amplifier	07263	μA714HC
U3	1-926216-001	Integrated Circuit D-A Converter	24355	AD7542JN
U4	1-926215-001	Integrated Circuit D-A Converter	24355	AD7524JN
U5	1-926081-071	Integrated Circuit, Decoder	IND STD	74LS154
U6	1-926141-001	Integrated Circuit Op-Amplifier	07263	μA714HC
U7	1-926081-007	Integrated Circuit, Quad AND Gate	IND STD	74LS08
U8	1-926214-001	Circuit Module, A-D Converter	24355	ADC1140
U9	1-926081-073	Integrated Circuit, Octal Driver	IND STD	74LS244
U10	1-926081-019	Integrated Circuit, Quad OR Gate	IND STD	74LS32
U11	1-926081-003	Integrated Circuit Quad NOR Gate	IND STD	74LS02
U12	1-926149-012	Integrated Circuit BUS Buffer	IND STD	8T97
U13	1-926081-073	Integrated Circuit, Octal Driver	IND STD	74LS244
U14	1-926081-077	Integrated Circuit, Quad D Register	IND STD	74LS379
U15	1-926081-077	Integrated Circuit, Quad D Register	IND STD	74LS379
U16	1-926081-077	Integrated Circuit, Quad D Register	IND STD	74LS379
XU1		NOT USED		
XU2		NOT USED		
XU3	1-950020-004	Socket, IC, 16 contacts	00779	640358-3
XU4	1-950020-004	Socket, IC, 16 contacts	00779	640358-3
XU5		NOT USED		
XU6		NOT USED		
XU7		NOT USED		
XU8A	1-950045-001	Socket, IC	00779	531167-1
XU8B	1-950045-001	Socket, IC	00779	531167-1

PARTS LIST FOR MODEL 2075 A1A2A9

PWBA MOTHER BOARD

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A2A9

An example of a complete Reference Designator is:

A1A2A9R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
J1	1-910440-007	Connector, Card Edge 56 Contacts	07799	1-530842-7
J2	1-910440-007	Connector, Card Edge 56 Contacts	07799	1-530842-7
J3	1-910440-007	Connector, Card Edge 56 Contacts	07799	1-530842-7
J4	1-910440-007	Connector, Card Edge 56 Contacts	07799	1-530842-7
J5	1-910440-007	Connector, Card Edge 56 Contacts	07799	1-530842-7
J6	1-910440-007	Connector, Card Edge 56 Contacts	07799	1-530842-7
J7	1-910440-007	Connector, Card Edge 56 Contacts	07799	1-530842-7
J8	1-910440-007	Connector, Card Edge 56 Contacts	07799	1-530842-7
W1	1-006497-001	Assembly, Cable	88869	

PARTS LIST FOR MODEL 2075 A1A3

RF CHASSIS ASSEMBLY

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A3

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
A1	4-006428-001	Assembly, RF Amplifier	88869	
A2	4-006419-001	Assembly, Second Converter	88869	
A3	4-006420-001	Assembly, First 30 MHz IF, Preamplifier	88869	
A4	4-006421-001	Assembly Second 30 MHz IF, Detector	88869	

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
A5	4-006422-001	Assembly, YIG Oscillator	88869	
W1	1-006503-001	Assembly, Cable	88869	
W2	1-006504-001	Assembly, Cable	88869	
W3	2-006502-001	Assembly, Cable	88869	
W4	2-006501-002	Assembly, Cable	88869	

PARTS LIST FOR MODEL 2075 A1A3A1

RF AMPLIFIER ASSEMBLY

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A3A1

An example of a complete Reference Designator is:

A1A3A1J1

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900255-026	Capacitor, Ceramic 0.01 µF, ±20%, 50 Vdc	29990	ATC200A103MC50X
C2	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C3	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C4	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C5	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C6	1-900255-026	Capacitor, Ceramic 0.01 µF, ±20%, 50 Vdc	29990	ATC200A103MC50X
C7	1-900255-026	Capacitor, Ceramic 0.01 µF, ±20%, 50 Vdc	29990	ATC200A103MC50X
C8	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK058X103K
C9	1-900255-026	Capacitor, Ceramic 0.01 µF, ±20%, 50 Vdc	29990	ATC200A103MC50X
C10	1-900255-026	Capacitor, Ceramic 0.01 µF, ±20%, 50 Vdc	29990	ATC200A103MC50X
C11	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C12	1-900255-026	Capacitor, Ceramic 0.01 μF, ±20%, 50 Vdc	29990	ATC200A103MC50X
C13	1-900255-026	Capacitor, Ceramic 0.01 μF, ±20%, 50 Vdc	29990	ATC200A103MC50X
C14	1-900122-037	Capacitor, Ceramic 0.01 μF, ±10%, 100 Vdc	IND STD	CK05BX103K
C15	1-900255-026	Capacitor, Ceramic 0.01 μF, ±20%, 50 Vdc	29990	ATC200A103MC50X
C16	1-900255-026	Capacitor, Ceramic 0.01 μF, ±20%, 50 Vdc	29990	ATC200A103MC50X
C17	1-900255-026	Capacitor, Ceramic 0.01 μF, ±20%, 50 Vdc	29990	ATC200A103MC50X
C18	1-900122-037	Capacitor, Ceramic 0.01 μF, ±10%, 100 Vdc	IND STD	CK05BX103K
C19	1-900122-037	Capacitor, Ceramic 0.01 μF, ±10%, 100 Vdc	IND STD	CK05BX103K
C20	1-900122-037	Capacitor, Ceramic 0.01 μF, ±10%, 100 Vdc	IND STD	CK05BX103K
C21	1-900122-037	Capacitor, Ceramic 0.01 μF, ±10%, 100 Vdc	IND STD	CK05BX103K
C22	1-900122-037	Capacitor, Ceramic 0.01 μF, ±10%, 100 Vdc	IND STD	CK05BX103K
C23	1-900122-037	Capacitor, Ceramic 0.01 μF, ±10%, 100 Vdc	IND STD	CK05BX103K
C24	1-900251-001	Capacitor, Feedthru 0.001 μF, 100 Vdc	33095	54-713-001-102P
C25	1-900251-001	Capacitor, Feedthru 0.001 μF, 100 Vdc	33095	54-713-001-102P
C26	1-900251-001	Capacitor, Feedthru 0.001 μF, 100 Vdc	33095	54-713-001-102P
C27	1-900251-001	Capacitor, Feedthru 0.001 μF, 100 Vdc	33095	54-713-001-102P
C28	1-900251-001	Capacitor, Feedthru 0.001 μF, 100 Vdc	33095	54-713-001-102P
C29	1-900251-001	Capacitor, Feedthru 0.001 μF, 100 Vdc	33095	54-713-001-102P
C30	1-900251-001	Capacitor, Feedthru 0.001 μF, 100 Vdc	33095	54-713-001-102P
C31	1-900044-002	Capacitor, Standoff 0.001 μF, 500 Vdc	33095	54-803-003-102P
C32	1-900044-002	Capacitor, Standoff 0.001 μF, 500 Vdc	33095	54-803-003-102P

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C33	1-900044-002	Capacitor, Standoff 0.001 μF, 500 Vdc	33095	54-803-003-102P
CR1	1-913248-001	Diode, PIN, VBR = 120 V	59365	MX1585
CR2	1-913245-001	Diode, Schottky Detector	59365	MX1601
CR3	1-913245-001	Diode, Schottky Detector	59365	MX1601
CR4	1-913246-001	Diode, Mixer	50434	5082-2294
FL1		Filter, Lowpass (P/O PC Board)		
FL2		Filter, Lowpass (P/O PC Board)		
FL3	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL4	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL5	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL6	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL7	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL8	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
J1	2-006515-002	Connector, RF	88869	
J2	2-006515-001	Connector, RF	88869	
J3	2-006515-001	Connector, RF	88869	
K1	1-942049-001	Relay, Reed, DPDT Form Coil: 5 V	11532	172D-5
K2	2-006522-002	Relay, Reed, DPDT Form Coil: 5 V	88869	
K3	2-006522-001	Relay, Reed, DPDT Form Coil: 5 V	88869	
K4	1-942049-001	Relay, Reed, DPDT Form Coil: 5 V	11532	172D-5
L1	1-006518-001	Inductor, RF	88869	
L2	1-006518-001	Inductor, RF	88869	
L3	1-006518-001	Inductor, RF	88869	
L4	1-906003-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	DD-6.80
L5	1-906003-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	DD-6.80
L6	1-906003-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	DD-6.80
Q1	1-958183-001	Transistor, Silicon, NPN	50434	HXTR-3645
Q2	1-958000-002	Transistor, Silicon, PNP	IND STD	2N3906
Q3	1-958000-001	Transistor, Silicon, NPN	IND STD	2N3904
Q4	1-958112-001	Transistor, Silicon, NPN	12895	NE21935D
Q5	1-958000-002	Transistor, Silicon, PNP	IND STD	2N3906

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
Q6	1-958112-001	Transistor, Silicon, NPN	12895	NE21935D
Q7	1-958000-002	Transistor, Silicon, PNP	IND STD	2N3906
R1	1-945205-037	Resistor, Film, Chip 33 ohms, ± 5%, 1/2 W	0000C	RSW/CC/33/5%/T
R2	1-945205-037	Resistor, Film, Chip 33 ohms, ± 5%, 1/2 W	0000C	RSW/CC/33/5%/T
R3	1-404690-004	Resistor, Film, Chip 22 ohms, ± 10%	88869	
R4	1-945086-063	Resistor, Composition 1 k ohms, ± 5%, 1/8 W	01121	BB1025
R5	1-945086-046	Resistor, Composition 200 ohms, ± 5%, 1/8 W	01121	BB2015
R6	1-404690-003	Resistor, Film, Chip 20 ohms, ± 10%	88869	
R7	1-404690-003	Resistor, Film, Chip 20 ohms, ± 10%	88869	
R8	1-945027-164	Resistor, Film 499 ohms, ± 1%, 1/4 W	IND STD	RN55D4990F
R9	1-945027-261	Resistor, Film 5.11 k ohms, ± 1%, 1/4 W	IND STD	RN55D5111F
R10	1-945027-193	Resistor, Film 1 k ohms, ± 1%, 1/4 W	IND STD	RN55D1001F
R11	1-945027-239	Resistor, Film 3010 ohms, ± 1%, 1/4 W	IND STD	RN55D3011F
R12	1-945027-222	Resistor, Film 2 k ohms, ± 1%, 1/4 W	IND STD	RN55D2001F
R13	1-945027-142	Resistor, Film 294 ohms, ± 1%, 1/4 W	IND STD	RN55D2940F
R14	1-945086-063	Resistor, Composition 1 k ohms, ± 5%, 1/8 W	01121	BB1025
R15	1-945086-046	Resistor, Film, Chip 200 ohms, ± 5%, 1/8 W	01121	BB2015
R16	1-404690-004	Resistor, Film, Chip 22 ohms, ± 10%	88869	
R17	1-404690-004	Resistor, Film 22 ohms, ± 10%	88869	
R18	1-945027-164	Resistor, Film 499 ohms, ± 1%, 1/4 W	IND STD	RN55D4990F
R19	1-945027-239	Resistor, Film 3010 ohms, ± 1%, 1/4 W	IND STD	RN55D3011F
R20	1-945027-222	Resistor, Film 2 k ohms, ± 1%, 1/4 W	IND STD	RN55D2001F

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R21	1-945027-142	Resistor, Film 294 ohms, ± 1%, 1/4 W	IND STD	RN55D2940F
R22	1-945086-063	Resistor, Composition 1 k, ± 5%, 1/8 W	01121	BB1025
R23	1-945086-041	Resistor, Composition 120 ohms, ± 5%, 1/8 W	01121	BB1215
R24	1-404690-041	Resistor, Film, Chip 15 ohms, ± 10%,	88869	
R25	1-404690-001	Resistor, Film, Chip 15 ohms, ± 10%	88869	
R26	1-945027-164	Resistor, Film 499 ohms, ± 1%, 1/4 W	IND STD	RN55D4990F
R27	1-945027-239	Resistor, Film 3010 ohms, ± 1%, 1/4 W	IND STD	RN55D3011F
R28	1-945027-222	Resistor, Film 2 k ohms, ± 1%, 1/4 W	IND STD	RN55D2001F
R29	1-945027-134	Resistor, Film 243 ohms, ± 1%, 1/4 W	IND STD	RN55D2430F
R30	1-945205-037	Resistor, Film, Chip 33 ohms, ± 5%, 1/2 W	0000C	RSW/CC/33/5%/T
R31	1-945205-037	Resistor, Film, Chip 33 ohms, ± 5%, 1/2 W	0000C	RSW/CC/33/5%/T
R32	1-404690-004	Resistor, Film, Chip 22 ohms, ± 10%	88869	
R33	1-945027-356	Resistor, Film 49.9 k ohms, ± 1%, 1/4 W	IND STD	RN55D4992F
R34	1-945205-097	Resistor, Film, Chip 10 k ohms, ± 5%, 1/2 W	0000C	RSW/CC/10K/5%/T
R35	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R36	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R37	1-945162-011	Resistor, Variable 20 K OHMS, ± 20%, 1/2 W	80740	72PR20K
R38	1-945027-201	Resistor, Film 1210 ohms, ± 1%, 1/4 W	IND STD	RN55D1211F
R39	1-945027-289	Resistor, Film 10 k ohms, ± 1%, 1/4 W	IND STD	RN55D1002F
R40	1-945027-436	Resistor, Film 340 k ohms, ± 1%, 1/4 W	IND STD	RN55D3403F
R41	1-945162-016	Resistor, Variable 1 M ohms, ± 20%, 1/2 W	80740	72PRIMEG

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R42	1-945027-097	Resistor, Film 100 ohms, ± 1%, 1/4 W	IND STD	RN55D1000F
R43	1-945205-202	Resistor, Film, Chip 5.23 ohms, ± 5%,	0000C	RSW/CC/5.23/5%/T
R44	1-945205-202	Resistor, Film, Chip 5.23 ohms, ± 5%,	0000C	RSW/CC/5.23/5%/T
R45	1-945205-058	Resistor, Film, Chip 240 ohms, ± 5%, 1/4 W	0000C	RSW/CC/240/5%/T
R46	1-945205-023	Resistor, Film, Chip 8.2 ohms, ± 5%, 1/2 W	0000C	RSW/CC/8.2/5%/T
R47	1-945205-023	Resistor, Film, Chip 8.2 ohms, ± 5%, 1/2 W	0000C	RSW/CC/8.2/5%/T
R48	1-945205-200	Resistor, Film, Chip 137 ohms, ± 5%, 1/2 W	0000C	RSW/CC/137/5%/T
R49	1-945205-066	Resistor, Film, Chip 510 ohms, ± 5%, 1/2 W	0000C	RSW/CC/510/5%/T
R50	1-945027-289	Resistor, Film 10 k ohms, ± 1%, 1/4 W	IND STD	RN55D1002F
U1	1-926141-001	Integrated Circuit Op-Amplifier	07263	μA714HC
W1	1-203196-001	Assembly, Cable, Coaxial	88869	
W2	1-203197-001	Assembly, Cable, Coaxial	88869	
W3	2-006495-001	Assembly, Cable, Power	88869	
W4	2-006524-001	Assembly, Cable, Coaxial	88869	

PARTS LIST FOR MODEL 2075 A1A3A2

SECOND CONVERTER ASSEMBLY

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A3A2

An example of a complete Reference Designator is:

A1A3A2R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
J1	2-006431-001	Assembly, Input	88869	
J2	2-006431-001	Assembly, Output	88869	
J3	1-910148-002	Connector, SMA, LO Output	16179	2058-5029-00

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
J4	1-910365-006	Connector, SMA	16179	2052-1350-00
J5	1-910365-006	Connector, SMA	16179	2052-1350-00
J6	1-910139-005	Connector, SMB	98291	51-043-0000
J7	1-910139-005	Connector, SMB	98291	51-043-0000
W1	1-006451-001	Cable, Coaxial		
W2	1-006452-001	Cable, Coaxial		
W3	1-006453-001	Cable Assembly		
C1	1-900251-001	Capacitor, Ceramic, Feedthru 1000 pF, 100 Vdc	33095	54-713-001-102P
C2	1-900115-011	Capacitor, Electrolytic 10 μF, 35 Vdc	56289	196D106X0035PE4
C3	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C4		P/O of PC Board		
C5		P/O of PC Board		
C6		P/O of PC Board		
C7		P/O of PC Board		
C8		P/O of PC Board		
C9		P/O of PC Board		
C10	1-900098-016	Capacitor, Mica 27 pF, ± 5%, 300 Vdc	IND STD	DM5EC270J
CR1	1-913247-001	Diode, Silicon, Quad	50434	5082-2277
J1	2-006431-001	Assembly, Input, SMA	88869	
J2	2-006431-001	Assembly, Output, SMA	88869	
J3	1-910148-002	Connector, RF, SMA	16179	2058-5029-00
J4	1-910365-006	Connector, RF, SMA	16179	2052-1350-00
J5	1-910365-006	Connector, RF, SMA	16179	2052-1350-00
J6	1-910139-005	Connector, RF, SMB	98291	51-043-0000
J7	1-910139-005	Connector, RF, SMB	98291	51-043-0000
L1	1-006449-001	Inductor, Fixed, RF	88869	
L2	1-006449-002	Inductor, Fixed, RF	88869	
L3	1-006449-003	Inductor, Fixed, RF	88869	
L4		P/O of PC Board		
L5	1-906032-008	Inductor, Fixed, RF 0.39 μH, ± 10%	00213	WEE-0.39
L6	1-906032-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	WEE-6.8
Q1	1-958179-001	Transistor, Silicon, NPN	50434	HXTR-4101

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R1	1-945027-089	Resistor, Film 82.5 ohms, ± 1%, 1/4 W	IND STD	RN55D82R5F
R2	1-945027-235	Resistor, Film 2.74 k ohms, ± 1%, 1/4 W	IND STD	RN55D2741F
R3	1-945027-177	Resistor, Film 681 ohms, ± 1%, 1/4 W	IND STD	RN55D6810F
R4	1-945027-097	Resistor, Film 100 ohms, ± 1%, 1/4 W	IND STD	RND55D1000F
R5	1-945027-001	Resistor, Film 10 ohms, ± 1%, 1/4 W	IND STD	RN55D10R0F
R6	1-945086-053	Resistor, Composition 390 ohms, ± 5%, 1/8 W	01121	BB3915
R7	1-945086-049	Resistor, Composition 270 ohms, ± 5%, 1/8 W	01121	BB2715
R8	1-945086-021	Resistor, Composition 18 ohms, ± 5%, 1/8 W	01121	BB1805
R9	1-945086-063	Resistor, Composition 1 k ohms, ± 5%, 1/8 W	01121	BB1025
R10	1-945086-031	Resistor, Composition 47 ohms, ± 5%, 1/8 W	01121	BB4705
W1	2-006451-001	Assembly, Cable, RF	88869	
W2	2-006452-001	Assembly, Cable, RF	88869	
W3	2-006453-001	Assembly, Cable, Power	88869	

PARTS LIST FOR MODEL 2075 A1A3A3

FIRST 30 MHz IF PREAMP ASSEMBLY

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A3A3

An example of a complete Reference Designator is:

A1A3A3R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C2	1-900098-033	Capacitor, Mica 120 pF, ± 5%, 300 V dc	IND STD	DM5FC121J
C3	1-900117-001	Capacitor, Ceramic, Variable 2-10 pF	91293	9312

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C4	1-900098-009	Capacitor, Mica 10 pF, ±5%, 300 Vdc	IND STD	DM5CC100J
C5	1-900098-014	Capacitor, Mica 22 pF, ±5%, 300 Vdc	IND STD	DM5CC220J
C6	1-900117-001	Capacitor, Ceramic, Variable 2-10 pF	91293	9312
C7	1-900098-028	Capacitor, Mica 75 pF, ±5%, 300 Vdc	IND STD	DM5EC750J
C8	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C9	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C10	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C11	1-900098-034	Capacitor, Mica 130 pF, ±5%, 100 Vdc	IND STD	DM5FA131J
C12	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C13	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C14	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C15	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C16	1-900122-049	Capacitor, Ceramic 0.1 µF, ±10%, 50 Vdc	IND STD	CK05BX104K
C17	1-900098-033	Capacitor, Mica 120 pF, ±5%, 300 Vdc	IND STD	DM5FC121J
C18	1-900117-001	Capacitor, Ceramic, Variable 2-10 pF	91293	9312
C19	1-900098-009	Capacitor, Mica 10 pF, ±5%, 300 Vdc	IND STD	DM5CC100J
C20	1-900098-014	Capacitor, Mica 22 pF, ±5%, 300 Vdc	IND STD	DM5CC220J
C21	1-900117-001	Capacitor, Ceramic, Variable 2-10 pF	91293	9312
C22	1-900098-028	Capacitor, Mica 75 pF, ±5%, 300 Vdc	IND STD	DM5EC750J
C23	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K
C24	1-900122-037	Capacitor, Ceramic 0.01 µF, ±10%, 100 Vdc	IND STD	CK05BX103K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C25	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C26	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C27	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C28	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C29	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C30	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C31	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C32	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100Vdc	IND STD	CK05BX103K
C33	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C34	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C35	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C36	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C37	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C38	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C39	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C40	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C41	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C42	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C43	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C44		NOT USED		
C45	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C46	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C47	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C48	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C49	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C50	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C51	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C52	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C53	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C54	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C55	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
CR1	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
CR2	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
CR3	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
CR4	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
CR5	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
CR6	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
CR7	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
FL1	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL2	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL3	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL4	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL5	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
J1	1-910197-001	Connector, RF, SMB	98291	51-047-0000
J2	1-910367-001	Connector, RF, SMB	98291	51-051-0000
J3	1-910367-001	Connector, RF, SMB	98291	51-051-0000
J4	1-910367-001	Connector, RF, SMB	98291	51-051-0000
J5	1-910367-001	Connector, RF, SMB	98291	51-051-0000

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
J6	1-910377-001	Connector, RF, SMB	98291	51-053-0000
L1	1-403395-047	Inductor, Fixed, RF, Variable 0.24 μH	88869	
L2	4-403394-045	Inductor, Fixed, RF 1.08 μH	88869	
L3	4-403394-044	Inductor, Fixed, RF 1.8 μH	88869	
L4	1-906032-026	Inductor, Fixed, RF 12 μH	00213	WEE-12
L5	1-906032-002	Inductor, Fixed, RF 0.12 μH	00213	WEE-0.12
L6	4-403395-048	Inductor, Fixed, RF, Variable 0.48 μH	88869	
L7	1-403395-047	Inductor, Fixed, RF, Variable 0.24 μH	88869	
L8	4-403394-045	Inductor, Fixed, RF 1.08 μH	88869	
L9	4-403394-044	Inductor, Fixed, RF 1.8 μH	88869	
L10	1-906032-026	Inductor, Fixed, RF 12 μH	02114	WEE-12
L11	1-906032-002	Inductor, Fixed 0.12 μH	02114	WEE-0.12
L12	4-403395-049	Inductor, Fixed, RF 0.24 μH	88869	
L13	1-906032-015	Inductor, Fixed, RF 1.5 μH	02114	WEE-1.5
L14	1-906032-023	Inductor, Fixed, RF 6.8 μH	02114	WEE-6.8
L15	1-906032-023	Inductor, Fixed, RF 6.8 μH	02114	WEE-6.8
L16	1-906032-023	Inductor, Fixed, RF 6.8 μH	02114	WEE-6.8
L17	1-906032-023	Inductor, Fixed, RF 6.8 μH	02114	WEE-6.8
L18	1-906032-023	Inductor, Fixed, RF 6.8 μH	02114	WEE-6.8
L19	1-906032-023	Inductor, Fixed, RF 6.8 μH	02114	WEE-6.8
Q1	1-958101-001	Transistor, Silicon, NPN	04713	2N6304
Q2	1-958018-001	Transistor, Silicon, NPN	04713	2N5179
Q3	1-958101-001	Transistor, Silicon, NPN	04713	2N6304
Q4	1-958018-001	Transistor, Silicon, NPN	04713	2N5179

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
Q5	1-958000-001	Transistor, Silicon, NPN	04713	2N3904
Q6	1-958088-001	Transistor, Silicon, PNP	04713	2N5583
Q7	1-958088-101	Transistor, Silicon, NPN	04713	2N5943
Q8	1-958000-001	Transistor, Silicon, NPN	04713	2N3904
Q9	1-958088-001	Transistor, Silicon, PNP	04713	2N5583
Q10	1-958088-101	Transistor, Silicon, PPN	04713	2N5943
R1	1-945027-297	Resistor, Film 12.1 k ohms, ± 1%, 1/4 W	IND STD	RN55D1212F
R2	1-945037-247	Resistor, Film 3.65 k ohms, ± 1%, 1/4 W	IND STD	RN55D3651F
R3	1-945027-281	Resistor, Film 8.25 k ohms, ± 1%, 1/4 W	IND STD	RN55D8251F
R4	1-945027-236	Resistor, Film 2.8 k ohms, ± 1%, 1/4 W	IND STD	RN55D2801F
R5	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R6	1-945027-222	Resistor, Film 2 k ohms, ± 1%, 1/4 W	IND STD	RN55D2001F
R7	1-945027-185	Resistor, Film 825 ohms, ± 1%, 1/4 W	IND STD	RN55D8250F
R8	1-945027-281	Resistor, Film 8.25 k ohms, ± 1%, 1/4 W	IND STD	RN55D8251F
R9	1-945027-281	Resistor, Film 8.25 k ohms, ± 1%, 1/4 W	IND STD	RN55D8251F
R10	1-945027-193	Resistor, Film 1 k ohms, ± 1%, 1/4 W	IND STD	RN55D1001F
R11	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R12		NOT USED		
R13	1-945027-235	Resistor, Film 2.74 k ohms, ± 1%, 1/4 W	IND STD	RN55D2741F
R14	1-945027-243	Resistor, Film 3.32 k ohms, ± 1%, 1/4 W	IND STD	RN55D3321F
R15	1-945027-216	Resistor, Film 1.74 k ohms, ± 1%, 1/4 W	IND STD	RN55D1741F
R16	1-945027-139	Resistor, Film 274 ohms, ± 1%, 1/4 W	IND STD	RN55D2740F
R17	1-945027-139	Resistor, Film 274 ohms, ± 1%, 1/4 W	IND STD	RN55D2740F
R18	1-945027-114	Resistor, Film 150 k ohms, ± 1%, 1/4 W	IND STD	RN55D1500F

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R19	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R20	1-945027-057	Resistor, Film 38.3 ohms, ± 1%, 1/4 W	IND STD	RN55D38R3F
R21	1-945027-097	Resistor, Film 100 ohms, ± 1%, 1/4 W	IND STD	RN55D1000F
R22	1-945027-281	Resistor, Film 8.25 k ohms, ± 1%, 1/4 W	IND STD	RN55D8251F
R23	1-945027-281	Resistor, Film 8.25 k ohms, ± 1%, 1/4 W	IND STD	RN55D8251F
R24	1-945027-162	Resistor, Film 475 ohms, ± 1%, 1/4 W	IND STD	RN55D4750F
R25	1-945027-001	Resistor, Film 10 ohms, ± 1%, 1/4 W	IND STD	RN55D10R0F
R26	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R27	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R28	1-945000-130	Resistor, Composition 47 ohms, ± 5%, 1/4 W	01121	CB4705
R29	1-945027-185	Resistor, Film 825 ohms, ± 1%, 1/4 W	IND STD	RN55D8250F
R30	1-945027-113	Resistor, Film 147 ohms, ± 1%, 1/4 W	IND STD	RN55D1470F
R31	1-945000-154	Resistor, Composition 470 ohms, ± 5%, 1/4 W	01121	CB4715
R32	1-945027-094	Resistor, Film 93.1 ohms, ± 1%, 1/4 W	IND STD	RN55D93R1F
R33	1-945027-191	Resistor, Film 935 ohms, ± 1%, 1/4 W	IND STD	RN55D9350F
R34	1-945027-057	Resistor, Film 38.3 ohms, ± 1%, 1/4 W	IND STD	RN55D38R3F
R35	1-945000-153	Resistor, Composition 430 k ohms, ± 5%, 1/4 W	011211	CB4315
R36	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	011211	CB1005
R37	1-945001-147	Resistor, Composition 240 ohms, ± 5%, 1/2 W	011211	B2415
R38	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R39	1-945027-001	Resistor, Film 10 ohms, ± 1%, 1/4 W	IND STD	RN55D10R0F

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R40	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R41	1-945027-113	Resistor, Film 147 ohms, ± 1%, 1/4 W	IND STD	RN55D1470F
R42	1-945027-185	Resistor, Film 825 ohms, ± 1%, 1/4 W	IND STD	RN55D8250F
R43	1-945000-130	Resistor, Composition 47 ohms, ± 5%, 1/4 W	01121	CB4705
R44	1-945000-154	Resistor, Composition 470 ohms, ± 5%, 1/4 W	01121	CB4715
R45	1-945027-094	Resistor, Film 93.1 ohms, ± 1%, 1/4 W	IND STD	RN55D93R1F
R46	1-945027-191	Resistor, Film 935 ohms, ± 1%, 1/4 W	IND STD	RN55D9310F
R47		NOT USED		
R48	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R49	1-945000-153	Resistor, Composition 430 ohms, ± 5%, 1/4 W	01121	CB4315
R50	1-945001-147	Resistor, Composition 240 ohms, ± 5%, 1/2 W	01121	DB2415
R51	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R52	1-945027-057	Resistor, Film 38.3 ohms, ± 1%, 1/4 W	IND STD	RN55D38R3F
R53	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R54	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R55	1-945000-190	Resistor, Composition 15 k ohms, ± 5%, 1/4 W	01121	CB1535
R56	1-945000-166	Resistor, Composition 1.5 K ohms, ± 5%, 1/4 W	01121	CB1525
R57	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R58	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
U1	1-926126-001	Integrated Circuit Op-Amplifier	04713	LM324N
W1	2-006495-002	Assembly, Cable, Power	88869	
W2	2-006501-004	Assembly, Cable, RF	88869	

PARTS LIST FOR MODEL 2075 A1A3A4

SECOND 30 MHz IF DETECTOR ASSEMBLY

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A3A4

An example of a complete Reference Designator is:

A1A3A4C1

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1		NOT USED		
C2		NOT USED		
C3		NOT USED		
C4		NOT USED		
C5		NOT USED		
C6		NOT USED		
C7		NOT USED		
C8		NOT USED		
C9		NOT USED		
C10		NOT USED		
C11		NOT USED		
C12		NOT USED		
C13		NOT USED		
C14		NOT USED		
C15		NOT USED		
C16		NOT USED		
C17		NOT USED		
C18		NOT USED		
C19		NOT USED		
C10		NOT USED		
C21		NOT USED		
C22		NOT USED		
C23		NOT USED		
C24		NOT USED		
C25		NOT USED		
C27		NOT USED		
C28		NOT USED		
C29		NOT USED		

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C30		NOT USED		
C31		NOT USED		
C32		NOT USED		
C33		NOT USED		
C34		NOT USED		
C35	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%		

PARTS LIST FOR MODEL 2075 A1A3A4

PWBA SECOND 30 MHZ IF DETECTOR

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A3A4

An example of a complete Reference Designator is:

A1A3A4R36

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C1	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C2	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C3	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C4	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX104K
C5	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C6	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C7	1-900098-019	Capacitor, Mica 36 pF, ± 5%, 300 Vdc	IND STD	DM5EC360J
C8	1-900117-001	Capacitor, Ceramic, Variable 2-10 pF	91293	9312
C9	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C10	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C11	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C12	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C13	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C14	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C15	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C16	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C17	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C18	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C19	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C20	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C21	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C22	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C23	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C24	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C25	1-900117-001	Capacitor, Ceramic, Variable 2-10 pF	91293	9312
C26	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C27	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C28	1-900041-137	Capacitor, Plastic 1 μF, ± 5%, 50 Vdc	24152	22RA105J
C29	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C30	1-900041-137	Capacitor, Plastic 1 μF, ± 5%, 50 Vdc	24152	22RA105J
C31	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C32	1-900041-137	Capacitor, Plastic 1 μF, ± 5%, 50 Vdc	24152	22RA105J

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C33	1-900098-019	Capacitor, Mica 36 pF ± 5%, 300 Vdc	IND STD	DM5EC360J
C34	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C35	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C36	1-900115-003	Capacitor, Electrolytic 1 μF, 50 Vdc	56289	196D105X00504A1
C37	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C38	1-900115-003	Capacitor, Electrolytic 1 μF, 50 Vdc	56289	196D105X0050HA1
C39	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C40	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C41	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C42	1-900098-033	Capacitor, Mica 120 pF, ± 5%, 300 Vdc	IND STD	DM5FC121J
C43	1-900066-129	Capacitor, Ceramic 2.2 pF, ± 5%, 500 Vdc	95121	MC2.2 ± 5%
C44	1-900098-033	Capacitor, Mica 120 pF, ± 5%, 300 Vdc	IND STD	DM5FC121J
C45	1-900066-125	Capacitor, Ceramic 1.2 pF, ± 5%, 500 Vdc	95121	MC1.2 ± 5%
C46	1-900098-033	Capacitor, Mica 120 pF, ± 5%, 300 Vdc	IND STD	DM5FC121J
C47	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C48	1-900126-002	Capacitor, Ceramic 0.33 μF, ± 10%, 50 Vdc	IND STD	CK06BX334K
C49	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK5BX104K
C50	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C51	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C52	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K
C53	1-900098-034	Capacitor, Mica 130 pF, ± 5%, 100 Vdc	IND STD	DM5FA131J
C54	1-900122-037	Capacitor, Ceramic 0.01 μF, ± 10%, 100 Vdc	IND STD	CK05BX103K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C55	1-900098-034	Capacitor, Mica 130 pF, ± 5%, 100 Vdc	IND STD	DM5FA131J
C56	1-900122-025	Capacitor, Ceramic 0.001 μF, ± 10%, 100 VDC	IND STD	CK05BX102K
CR1	1-913007-002	Diode, Silicon Vr=75 V,=10 mA	IND STD	1N4148
CR2	1-913007-002	Diode, Silicon Vr=75 V,=10 mA	IND STD	1N4148
CR3	1-913007-002	Diode, Silicon Vr=75 V,=10 mA	IND STD	1N4148
CR4	1-913007-002	Diode, Silicon Vr=75 V,=10 mA	IND STD	1N4148
CR5	1-913007-002	Diode, Silicon Vr=75 V,=10 mA	IND STD	1N4148
CR6	1-913007-002	Diode, Silicon Vr=75 V,=10 mA	IND STD	1N4148
CR7	1-913007-002	Diode, Silicon Vr=75 V,=10 mA	IND STD	1N4148
CR8	1-913007-002	Diode, Silicon Vr=75 V,=10 mA	IND STD	1N4148
CR9	1-913055-002	Diode, Silicon Vr=20 V, If=35 mA	50434	5082-2810
CR10	1-913055-002	Diode, Silicon Vr=20 V, If=35 mA	50434	5082-2810
CR11	1-913055-002	Diode, Silicon Vr=20 V, If=35 mA	50434	5082-2810
CR12	1-913055-002	Diode, Silicon Vr=20 V, If=35 mA	50434	5082-2810
CR13	1-913055-001	Diode, Silicon Vr=70 V, If=15 mA	50434	5082-2800
CR14	1-913055-001	Diode, Silicon Vr=70 V, If=15 mA	50434	5082-2800
CR15	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
FL1	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL2	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
FL3	1-906013-001	Bead, Ferrite	02114	56-590-65/4B
J1	1-910377-001	Connector, RF, SMB	98291	51-053-0000
J2	1-910377-001	Connector, RF, SMB	98291	51-053-0000
J3	1-910377-001	Connector, RF, SMB	98291	51-053-0000
J4	1-910377-001	Connector, RF, SMB	98291	51-053-0000
J5	1-910377-001	Connector, RF, SMB	98291	51-053-0000

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
J6	1-910377-001	Connector, RF, SMB	98291	51-053-0000
L1	1-906003-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	DD-6.80
L2	1-906032-011	Inductor, Fixed, RF 0.68 μH 10%	00213	WEE-0.68
L3	1-906003-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	DD-6.80
L4	1-906003-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	DD-6.80
L5	1-906032-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	WEE-6.8
L6	1-906032-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	WEE-6.8
L7	1-906032-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	WEE-6.8
L8	1-906003-023	Inductor, Fixed, RF 6.8 μH, ± 10%	00213	DD-6.80
L9	4-403394-047	Inductor, Fixed, RF 1.3 μH	88869	
L10	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22
L11	4-403395-049	INDUCTOR, Fixed, RF 0.24 μH	88869	
L12	4-403395-049	Inductor, Fixed, RF 0.24 μH	88869	
L13	4-403395-049	Inductor, Fixed, RF 0.24 μH	88869	
L14	1-906003-006	Inductor, Fixed, RF 0.27 μH, ± 10%	00213	DD-0.27
Q1	1-958000-001	Transistor, Silicon, NPN	IND STD	2N3904
Q2	1-958088-001	Transistor, Silicon, PNP	IND STD	2N5583
Q3	1-958088-101	Transistor, Silicon, NPN	IND STD	2N5943
Q4	1-958000-001	Transistor, Silicon, NPN	IND STD	2N3904
Q5	1-958088-001	Transistor, Silicon, PNP	IND STD	2N5583
Q6	1-958088-101	Transistor, Silicon, NPN	IND STD	2N5943
Q7	1-958182-001	Transistor, Silicon, NPN	04713	MRF340
Q8	1-958000-001	Transistor, Silicon, NPN	IND STD	2N3904
Q9	1-958018-001	Transistor, Silicon, NPN	IND STD	2N5179
R1	1-945162-105	Resistor, Variable, Cermet 200 ohms, ± 20%, 1/2 W	80740	72XR500

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R2	1-945027-161	Resistor, Film 464 ohms, ± 1%, 1/4 W	IND STD	RN55D4640F
R3	1-945000-154	Resistor, Composition 470 ohms, ± 5%, 1/4 W	01121	CB4715
R4	1-945027-125	Resistor, Film 196 ohms, ± 1%, 1/4 W	IND STD	RN55D1960F
R5	1-945027-125	Resistor, Film 196 ohms, ± 1%, 1/4 W	IND STD	RN55D1960F
R6	1-945000-162	Resistor, Composition 1 K ohms, ± 5%, 1/4 W	01121	CB1025
R7	1-945027-191	Resistor, Film 953 ohms, ± 1%, 1/4 W	IND STD	RN55D9530F
R8	1-945027-094	Resistor, Film 93.1 ohms, ± 1%, 1/4 W	IND STD	RN55D93R1F
R9	1-945000-150	Resistor, Composition 330 ohms, ± 5%, 1/4 W	01121	CB3315
R10	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	IND STD	CB1005
R11	1-945002-138	Resistor, Composition 100 ohms, ± 5%, 1 W	01121	GB1015
R12	1-945027-001	Resistor, Film 10 ohms, ± 1%, 1/4 W	IND STD	RN55D10R0F
R13	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R14	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R15	1-945027-146	Resistor, Film 324 ohms, ± 1%, 1/4 W	IND STD	RN55D3240F
R16	1-945027-146	Resistor, Film 324 ohms, ± 1%, 1/4 W	IND STD	RN55D3240F
R17	1-945027-138	Resistor, Film 267 ohms, ± 1%, 1/4 W	IND STD	RN55D2670F
R18	1-945027-085	Resistor, Film 75 ohms, ± 1%, 1/4 W	IND STD	RN55D75R0F
R19	1-945027-094	Resistor, Film 93.1 ohms, ± 1%, 1/4 W	IND STD	RN55D93R1F
R20	1-945000-154	Resistor, Composition 470 ohms, ± 5%, 1/4 W	01121	CB4715
R21	1-945027-191	Resistor, Film 953 ohms, ± 1%, 1/4 W	IND STD	RN55D9530F
R22	1-945000-150	Resistor, Composition 330 ohms, ± 5%, 1/4 W	01121	CB3315

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R23	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R24	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R25	1-945002-138	Resistor, Composition 100 ohms, ± 5%, 1 W	01121	GB1015
R26	1-945000-166	Resistor, Composition 1.5 k ohms, ± 5%, 1/4 W	01121	CB1525
R27	1-945027-068	Resistor, Film 49.9 ohms, ± 1%, 1/4 W	IND STD	RN55D49R9F
R28	1-945080-111	Resistor, Wirewound 80 ohms, ± 1%, 10 W	91637	RH10-80R0-1%
R29	1-945027-083	Resistor, Film 71.5 ohms, ± 1%, 1/4 W	IND STD	RN55D71R5F
R30	1-945027-083	Resistor, Film 71.5 ohms, ± 1%, 1/4 W	IND STD	RN55D71R5F
R31	1-945027-083	Resistor, Film 71.5 ohms, ± 1%, 1/4 W	IND STD	RN55D71R5F
R32	1-945027-083	Resistor, Film 71.5 ohms, ± 1%, 1/4 W	IND STD	RN55D71R5F
R33	1-945027-068	Resistor, Film 49.9 ohms, ± 1%, 1/4 W	IND STD	RN55D49R9F
R34	1-945027-163	Resistor, Film 487 ohms, ± 1%, 1/4 W	IND STD	RN55D4870F
R35	1-945027-172	Resistor, Film 604 ohms, ± 1%, 1/4 W	IND STD	RN55D6040F
R36	1-945000-150	Resistor, Composition 330 ohms, ± 5%, 1/4 W	01121	CB3315
R37	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R38	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R39	1-945027-385	Resistor, Film 100 k ohms, ± 1%, 1/4 W	IND STD	RN55D1003F
R40	1-945162-116	Resistor, Variable, Cermet 1 M ohms, ± 20%, 1/2 W	80740	72XR1MEG.
R41	1-945027-193	Resistor, Film 1 k ohms, ± 1%, 1/4 W	IND STD	RN55D1001F
R42	1-945027-163	Resistor, Film 487 ohms, ± 1%, 1/4 W	IND STD	RN55D4870F
R43	1-945027-163	Resistor, Film 487 ohms, ± 1%, 1/4 W	IND STD	RN55D4870F

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R44	1-945000-161	Resistor, Composition 910 ohms, ± 5%, 1/4 W	01121	CB9115
R45	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R46	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R47	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R48	1-945000-114	Resistor, Compositio 10 ohms, ± 5%, 1/4 W	01121	CB1005
R49	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R50	1-945000-114	Resistor, Composition 10 ohms, ± 5%, 1/4 W	01121	CB1005
R51	1-945000-167	Resistor, Composition 1.6 k ohms, ± 5%, 1/4 W	01121	CB1625
R52	1-945000-179	Resistor, Composition 5.1 k ohms, ± 5%, 1/4 W	01121	CB5125
R53	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R54	1-945000-228	Resistor, Composition 560 k ohms, ± 5%, 1/4 W	01121	CB5645
R55	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R56	1-945000-203	Resistor, Composition 51 k ohms, ± 5%, 1/4 W	01121	CB5135
R57	1-945000-234	Resistor, Composition 1 M ohms, ± 5%, 1/4 W	01121	CB1055
R58	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R59	1-945000-158	Resistor, Composition 680 ohms, ± 5%, 1/4 W	01121	CB6815
R60	1-945000-186	Resistor, Composition 10 k ohms, ± 5%, 1/4 W	01121	CB1035
R61	1-945000-152	Resistor, Composition 390 ohms, ± 5%, 1/4 W	01121	CB3915
R62	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R63	1-945000-162	Resistor, Composition 1 k ohms, ± 5%, 1/4 W	01121	CB1025
R64	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R65	1-945000-138	Resistor, Composition 100 ohms, ±5%, 1/4 W	01121	CB1015
R66	1-945000-166	Resistor, Composition 1.5 k ohms, ±5%, 1/4 W	01121	CB1525
R67	1-945000-190	Resistor, Composition 15 k ohms, ±5%, 1/4 W	01121	CB1535
R68	1-945000-131	Resistor, Composition 51 ohms, ±5%, 1/4 W	01121	CB1505
R69	1-945000-200	Resistor, Composition 39 k ohms, ±5%, 1/4 W	01121	CB3935
U1	1-926126-001	Integrated Circuit, Op Amplifier	04713	LM324N
U2	1-926141-001	Integrated Circuit Op Amplifier	04713	UA714HC
W1	2-006495-003	Assembly, Cable, Power	88869	
W2	2-006501-001	Assembly, Cable, RF	88869	

PARTS LIST FOR MODEL 2075 A1A3A5

YIG OSCILLATOR ASSEMBLY

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A3A5

An example of a complete Reference Designator is:

A1A3A5P1

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
A1	4-006425-001	Assembly, YIG Driver	88869	
AT1	1-972013-xxx	Attenuator Pad, SMA (select in text, 1,2,3 or 4 dB)	24602	420X (x in dB)
R1	1-945080-101	Resistor, Wirewound 25 ohms, ±1%, 10 W	91637	RH10-25RO-1%
Y1	1-404672-002	Oscillator, YIG 2-4 GHz	88869	
W1	1-203208-001	Assembly, Cable, Power	88869	
C1	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CD1C
C2	1-900115-011	Capacitor, Electrolytic 10 μF, 35 Vdc	56289	196D106X0035PE4

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C3	1-900115-003	Capacitor, Electrolytic 1 µF, 50 Vdc	56289	196D105X0050HA1
C4	1-900115-003	Capacitor, Electrolytic 1 µF, 50 Vdc	56289	196D105X0050HA1
C5	1-900115-003	Capacitor, Electrolytic 1 µF, 50 Vdc	56289	196D105X0050HA1
C6	1-900136-002	Capacitor, Electrolytic 47 µF, 50 Vdc	56289	502D476G050CD1C
C7	1-900136-002	Capacitor, Electrolytic 47 µF, 50 Vdc	56289	502D476G050CD1C
C8	1-900126-002	Capacitor, Ceramic 0.33 µF, ± 10%, 50 Vdc	IND STD	CR05BX334K
C9	1-900126-002	Capacitor, Ceramic 0.33 µF, ± 10%, 50 Vdc	IND STD	CK05BX334K
CR1	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
CR2	1-913001-002	Diode, Silicon Vr=100 V, If=1000 mA	IND STD	1N4002
CR3	1-913007-002	Diode, Silicon Vr=75 V, If=10 mA	IND STD	1N4148
J1	1-910367-001	Connector, RF, SMB	98291	51-051-0000
J2	1-910442-202	Connector, Rectangular 8 Contacts	00779	640456-8
Q1	1-958000-001	Transistor, Silicon, NPN	04713	2N3904
Q2	1-958023-002	Transistor, Silicon, PNP	04713	2N4037
Q3	1-958114-001	Transistor, Silicon, PNP	04713	MJE1092
R1	1-945027-318	Resistor, Film 20 k ohms, ± 1%, 1/4 W	IND STD	RN55D2002F
R2	1-945152-109	Resistor, Variable, WW 5 k ohms, ± 5%, 1 W	80294	3250W-1-502
R3	1-945027-337	Resistor, Film 31.6 k ohms, ± 1%, 1/4 W	IND STD	RN55D3162F
R4	1-945000-170	Resistor, Composition 2.2 k ohms, ± 5%, 1/4 W	01121	CB2225
R5	1-945000-170	Resistor, Composition 2.2 k ohms, ± 5%, 1/4 W	01121	CB2225
R6	1-945027-356	Resistor, Film 49.9 k ohms, ± 1%, 1/4 W	IND STD	RN55D4992F
R7	1-945027-228	Resistor, Film 2.32 k ohms, ± 1%, 1/4 W	IND STD	RN55D2321F
R8	1-945152-107	Resistor, Variable, WW 1 k ohms, ± 5%, 1 W	80294	3250W-1-102

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R9	1-945027-192	Resistor, Film 976 ohms, ± 1%, 1/4 W	IND STD	RN55D9760F
R10	1-945027-385	Resistor, Film 100 k ohms, ± 1%, 1/4 W	IND STD	RN55D1003F
R11	1-945000-106	Resistor, Composition 4.7 ohms, ± 5%, 1/4 W	01121	CB4R75
R12	1-945167-037	Resistor, Wirewound 36.5 k ohms, ± 0.5%, 0.1 W	34238	MR500-6A-3652-0.5%
R13	1-945027-213	Resistor, Film 1.62 k ohms, ± 1%, 1/4 W	IND STD	RN55D1621F
R14	1-945152-109	Resistor, Variable, WW 5 k ohms, ± 5%, 1 W	80294	3250W-1-502
R15	1-945167-369	Resistor, Wirewound 22.9 k ohms, ± 0.5%, 0.1 W	34238	MR500-6A-2292-0.5%
R16	1-945152-110	Resistor, Variable, WW 10 k ohms, ± 5%, 1 W	80294	3250W-1-103
R17	1-945027-268	Resistor, Film 6.04 k ohms, ± 1%, 1/4 W	IND STD	RN55D6041F
R18	1-945167-300	Resistor, Wirewound 10 k ohms, ± 0.5%, 0.1 W	34238	MR500-6A-1002-0.5%
R19	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R20	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R21	1-945001-125	Resistor, Composition 30 ohms, ± 5%, 1/2 W	01121	EB3005
U1	1-926098-001	Integrated Circuit Op-Amplifier	07263	WA741TC
U2	1-926141-001	Integrated Circuit Op-Amplifier	07263	WA714H
U3	1-926218-001	Integrated Circuit Reference Zener	27014	LM399H9

PARTS LIST FOR MODEL 2075 A1A4

INTERCONNECTION BOARD

NOTE: To obtain a complete reference designator for any component in this section, prefix the Reference Designator shown in the left hand column with:

A1A4

An example of a complete Reference Designator is:

A1A4C15

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C2		Not Used		
C3		Not Used		
C4		Not Used		
C5		Not Used		
C6	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C7	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C8	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C9	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C10	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C11	1-900136-003	Capacitor, Electrolytic 220 μF, 35 Vdc	56289	502D227G035DGIC
C12	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C13	1-900122-025	Capacitor, Ceramic 0.001 μF, ± 10%, 200 Vdc	IND STD	CK05BX102K
C14	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C15	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C16	1-900122-025	Capacitor, Ceramic 0.001 μF, ± 10%, 200 Vdc	IND STD	CK05BX102K
C17	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C18	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C19	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C20	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C21	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C22	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C23	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C24	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C25	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C26	1-900136-003	Capacitor, Electrolytic 220 μF, 35 Vdc	56289	502D227G035DGIC
C27	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C28	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C29	1-900136-003	Capacitor, Electrolytic 220 μF, 35 Vdc	56289	502D227G035DGIC
C30	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C31	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C32	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C33	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C34	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C35	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C36	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C37	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C38	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C39	1-900136-003	Capacitor, Electrolytic 220 μF, 35 Vdc	56289	502D227G035DGIC
C40	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C41	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
C42	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C43	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C44	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C45	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C46	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C47	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C48	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C49	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C50	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C51	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C52	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C53	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C54	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C55	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C56	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C57	1-900136-003	Capacitor, Electrolytic 220 μF, 35 Vdc	56289	502D227G035DGIC
C58	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
C59	1-900136-002	Capacitor, Electrolytic 47 μF, 50 Vdc	56289	502D476G050CDIC
C60	1-900122-049	Capacitor, Ceramic 0.1 μF, ± 10%, 50 Vdc	IND STD	CK05BX104K
CR1	1-913216-001	Diode, LED 1.68 V @ 20 mA	50522	MV5074C
CR2	1-913216-001	Diode, LED 1.68 V @ 20 mA	50522	MV5074C

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
CR3	1-913216-001	Diode, LED 1.68 V @ 20 mA	50522	MV5074C
CR4	1-913216-001	Diode, LED 1.68 V @ 20 mA	50522	MV5074C
DS1	1-925033-001	Display, LED 10 bar graph	50522	MV57164
J1	1-910442-202	Connector, Rectang 8 contacts	00779	640456-8
J2	1-910442-201	Connector, Rectang 4 contacts	00779	640456-4
J3	1-910442-202	Connector, Rectang 8 contacts	00779	640456-8
J4	1-910442-202	Connector, Rectang 8 contacts	00779	640456-8
J5	1-910442-202	Connector, Rectang 8 contacts	00779	640456-8
J6	1-910442-202	Connector, Rectang 8 contacts	00779	640456-8
J7	1-910442-201	Connector, Rectang 4 contacts	00779	640456-4
J8	1-910362-310	Connector, Header, PcBd. 24 contacts	00779	102160-5
L1	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22
L2	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22
L3	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22
L4	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22
L5	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22
L6	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22
L7	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22
L8	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22
L9	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22
L10	1-906032-029	Inductor, Fixed, RF 22 μH, ± 10%	00213	WEE-22

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
L11	1-906032-029	Inductor, Fixed, RF 22 µH, ± 10%	00213	WEE-22
L12	1-906032-029	Inductor, Fixed, RF 22 µH, ± 10%	00213	WEE-22
L13	1-906032-029	Inductor, Fixed, RF 22 µH, ± 10%	00213	WEE-22
L14	1-906032-029	Inductor, Fixed, RF 22 µH, ± 10%	00213	WEE-22
L15	1-906032-029	Inductor, Fixed, RF 22 µH, ± 10%	00213	WEE-22
L16	1-906032-029	Inductor, Fixed, RF 22 µH, ± 10%	00213	WEE-22
L17	1-906032-029	Inductor, Fixed, RF 22 µH, ± 10%	00213	WEE-22
L18	4-403394-046	Inductor, Fixed, RF 18 µH	88869	
Q1	1-958114-001	Transistor, Silicon, PNP	04713	MJE1092
Q2	1-958000-001	Transistor, Silicon, NPN	IND STD	2N3904
Q3	1-958023-002	Transistor, Silicon, PNP	IND STD	2N4037
Q4		Not Used		
Q5	1-958000-001	Transistor, Silicon, NPN	IND STD	2N3904
Q6	1-958023-002	Transistor, Silicon, PNP	IND STD	2N4037
Q7	1-958000-001	Transistor, Silicon, NPN	IND STD	2N3904
Q8	1-958114-001	Transistor, Silicon, PNP	04713	MJE1092
R1	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R2	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R3	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R4	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R5	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R6	1-945000-150	Resistor, Composition 330 ohms, ± 5%, 1/4 W	01121	CB3315
R7	1-945000-150	Resistor, Composition 330 ohms, ± 5%, 1/4 W	01121	CB3315
R8	1-945027-257	Resistor, Film 4.64 kohms, ± 1%, 1/4 W	IND STD	RN55D4641F
R9	1-945027-193	Resistor, Film 1 kohms, ± 1%, 1/4 W	IND STD	RN55D1001F

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R10	1-945027-165	Resistor, Film 511 ohms, ± 1%, 1/4 W	IND STD	RN55D5110F
R11	1-945013-011	Resistor, Wirewound 0.62 ohms, ± 5%, 2 W	07716	BWH-0.62-5%
R12	1-945013-011	Resistor, Wirewound 0.62 ohms, ± 5%, 2 W	07716	BWH-0.62-5%
R13	1-945013-014	Resistor, Wirewound 0.82 ohms, ± 5%, 2 W	07716	BWH-0.82-5%
R14	1-945027-205	Resistor, Film 1.33 kohms, ± 1%, 1/4 W	IND STD	RN55D 1331F
R15	1-945000-170	Resistor, Composition 2.2 kohms, ± 5%, 1/4 W	01121	CB2225
R16	1-945167-328	Resistor, Wirewound 14 kohms, ± 0.5%, 0.1 W	34238	MR500-6A-14K-0.5%
R17	1-945081-007	Resistor, Variable, Cermet 1 kohms, ± 10%, 3/4W	80294	3009-1-102
R18	1-945167-710	Resistor, Wirewound 4.02 kohms, ± 0.5%, 0.1 W	34238	MR500-6A-4.02k-0.5%
R19	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R20	1-945000-138	Resistor, Composition 100 ohms, ± 5%, 1/4 W	01121	CB1015
R21	1-945000-162	Resistor, Composition 1 kohms, ± 5%, 1/4 W	01121	CB1025
R22	1-945027-222	Resistor, Film 2 kohms, ± 1%, 1/4 W	IND STD	RN55D2001F
R23	1-945027-213	Resistor, Film 1.62 kohms, ± 1%, 1/4 W	IND STD	RN55D1621F
R24	1-945000-162	Resistor, Composition 1 kohms, ± 5%, 1/4 W	01121	CB1025
R25	1-945000-162	Resistor, Composition 1 kohms, ± 5%, 1/4 W	01121	CB 1025
R26	1-945000-179	Resistor, Composition 5.1 kohms, ± 5%, 1/4 W	01121	CB 5125
R27	1-945000-194	Resistor, Composition 22 kohms, ± 5%, 1/4 W	01121	CB 2235
R28	1-945000-174	Resistor, Composition 3.3 kohms, ± 5%, 1/4 W	01121	CB 3325
R29	1-945000-108	Resistor, Composition 5.6 kohms, ± 5%, 1/4 W	01121	CB 5R65
R30	1-945000-154	Resistor, Composition 470 ohms, ± 5%, 1/4 W	01121	CB 4715

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
R31	1-945000-162	Resistor, Composition 1 kohms, ± 5%, 1/4 W	01121	CB 1025
R32	1-945000-174	Resistor, Composition 3.3 kohms, ± 5%, 1/4 W	01121	CB 3325
R33	1-945000-154	Resistor, Composition 470 ohms, ± 5%, 1/4 W	01121	CB 4715
R34	1-945000-162	Resistor, Composition 1 kohms, ± 5%, 1/4 W	01121	CB 1025
R35	1-945000-174	Resistor, Composition 3.3 kohms, ± 5%, 1/4 W	01121	CB 3325
R36	1-945027-205	Resistor, Film 1.33 kohms, ± 1%, 1/4 W	IND STD	RN55D 1331F
R37	1-945027-289	Resistor, Film 10 kohms, ± 1%, 1/4 W	IND STD	RN55D 1002F
R38	1-945027-313	Resistor, Film 17.8 kohms, ± 1%, 1/4 W	IND STD	RN55D 1782F
R39	1-945027-418	Resistor, Film 221 kohms, ± 1%, 1/4 W	IND STD	RN55D 2213F
R40	1-945027-289	Resistor, Film 10 kohms, ± 1%, 1/4 W	IND STD	RN55D 1002F
R41	1-945027-431	Resistor, Film 301 kohms, ± 1%, 1/4 W	IND STD	RN55D 3013F
R42	1-945027-289	Resistor, Film 10 kohms, ± 1%, 1/4 W	IND STD	RN55D 1002F
R43	1-945000-154	Resistor, Composition 470 ohms, ± 5%, 1/4 W	01121	CB 4715
R44	1-945000-162	Resistor, Composition 1 kohms, ± 5%, 1/4 W	01121	CB 1025
R45	1-945000-174	Resistor, Composition 3.3 kohms, ± 5%, 1/4 W	01121	CB 3325
R46	1-945000-174	Resistor, Composition 3.3 kohms, ± 5%, 1/4 W	01121	CB 3325
R47	1-945000-182	Resistor, Composition 6.8 kohms, ± 5%, 1/4 W	01121	CB 6825
R48	1-945000-162	Resistor, Composition 1 kohms, ± 5%, 1/4 W	01121	CB 1025
R49	1-945170-211	Network Resistor (8) 470 ohms, ± 2%, 1/8 W	01121	316 B471
R50	1-945027-165	Resistor, Film 511 ohms, ± 1%, 1/4 W	IND STD	RN55D5110F
RT1	1-945101-015	Thermistor, Disc 50 kohms, ± 10%	15801	KT 45J3

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
U1	1-926007-036	Integrated Circuit hex buffer	IND STD	SN 7406N
U2	1-926007-036	Integrated Circuit hex buffer	IND STD	SN 7406N
U3	1-926136-001	Integrated Circuit (7) drivers	56289	ULN-2003A
U4	1-926141-001	Integrated Circuit Op-Amp	07263	μA 714HC
U5	1-926126-001	Integrated Circuit quad op-amp	27014	LM 324N
U6	1-926218-001	Integrated Circuit reference gener	27014	LM 399H
DS1	1-950047-004	Socket, IC 20 contacts	52072	CA-20S-10RACI-01

PARTS LIST FOR MODEL 2075 A1A5

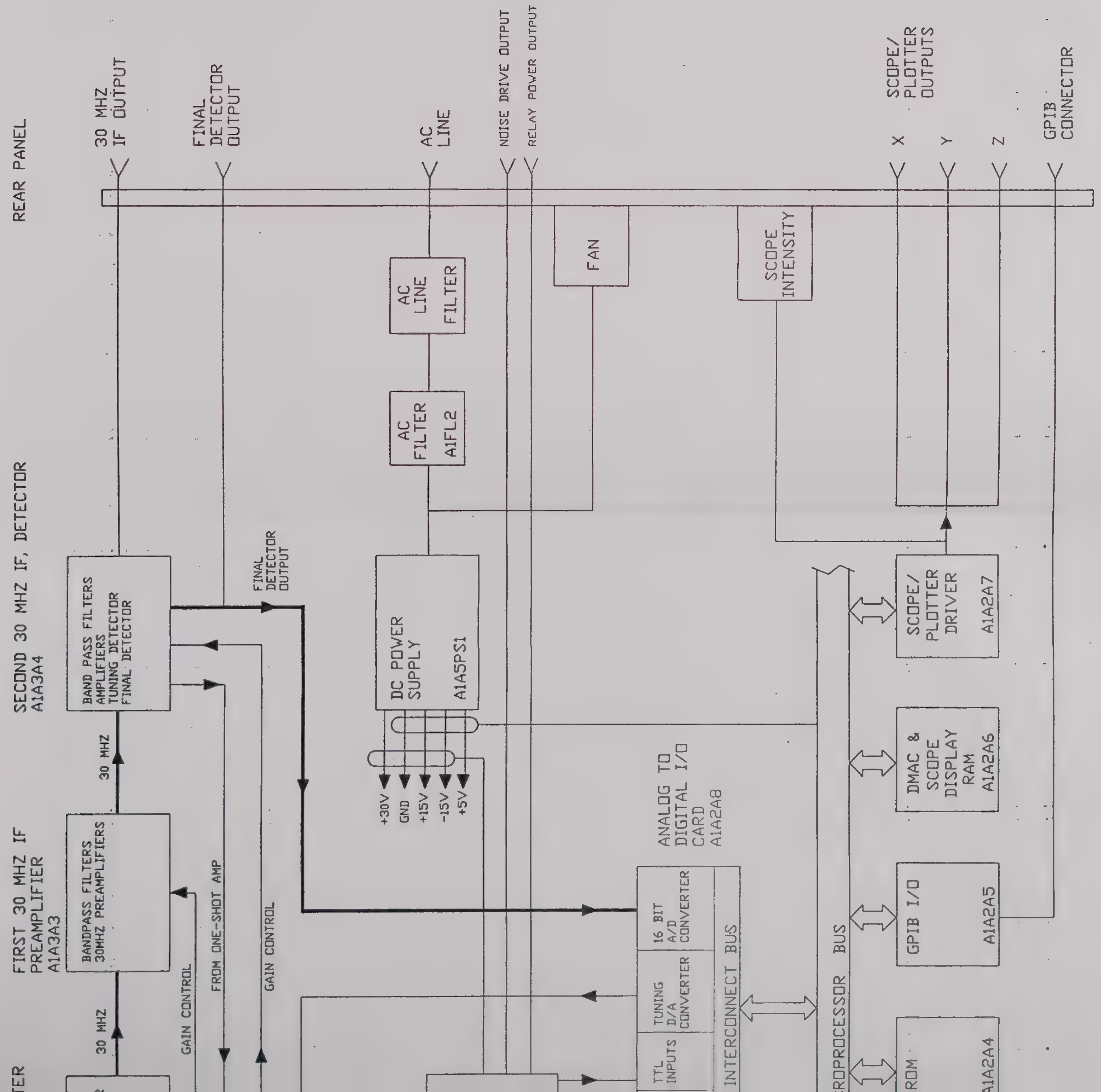
REAR PANEL ASSEMBLY

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
		For Serial Numbers 101 to 285:		
A1PS1	4-404673-001	30 Volt Power Supply	51106	SPS30-30
A1A5PS1	4-404674-001	± 15 Volt, 5 Volt Power Supply	08742	ETV 401

NOTE: The two power supplies listed above are used only in 2075's with serial numbers 101 to 285. For 2075's with serial numbers 286 and up, only one power supply is used.

Ref. Desig.	Eaton Part No.	Description	Mfr. Code	Mfr. Part No.
		For serial numbers 286 to 378:		
A1A5PS1	1-404746	± 15, +5 Volt Power Supply	74620	19A-S01-B-S1323B
		For serial numbers 379 and up:		
A1A5PS1	1-404771	± 15, +5 Volt Power Supply	79963	SX50-6001

Table 6-3. List of Recommended Spares
(Same as Table 6-1)


REAR PANEL
30 MHZ IF OUTPUT
FINAL DETECTOR OUTPUT
AC LINE
NOISE DRIVE OUTPUT
RELAY POWER OUTPUT
SCOPE/ PLOTTER OUTPUTS
X
Y
Z
GPIB CONNECTOR
FAN
SCOPE INTENSITY
AC LINE FILTER
AC FILTER A1FL2
SECOND 30 MHZ IF, DETECTOR A1A3A4
BAND PASS FILTERS AMPLIFIERS TUNING DETECTOR FINAL DETECTOR
FINAL DETECTOR OUTPUT
DC POWER SUPPLY A1A5PS1
+30V
GND
+15V
-15V
+5V
SCOPE/ PLOTTER DRIVER A1A2A7
DMAC & SCOPE DISPLAY RAM A1A2A6
GPIB I/O A1A2A5
ROM A1A2A4
30 MHZ
FIRST 30 MHZ IF PREAMPLIFIER A1A3A3
BANDPASS FILTERS 30MHZ PREAMPLIFIERS
30 MHZ
GAIN CONTROL
FROM ONE-SHOT AMP
GAIN CONTROL
ANALOG TO DIGITAL I/O CARD A1A2A8
16 BIT A/D CONVERTER
TUNING D/A CONVERTER
TTL INPUTS
INTERCONNECT BUS
ROPROCESSOR BUS
TER

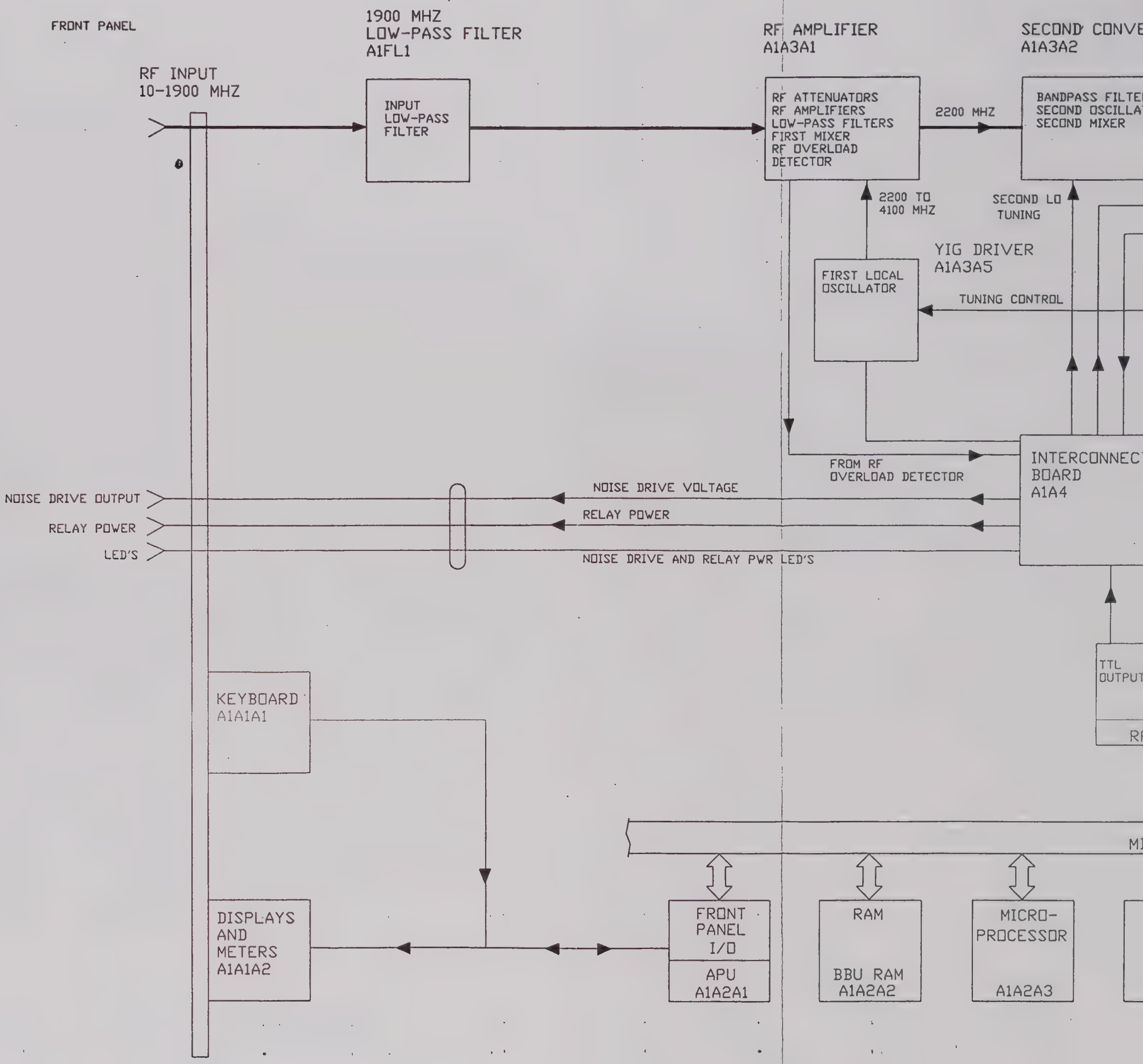

FRONT PANEL
1900 MHZ
LOW-PASS FILTER
A1FL1
RF AMPLIFIER
A1A3A1
SECOND CONVE
A1A3A2
RF INPUT
10-1900 MHZ
INPUT
LOW-PASS
FILTER
RF ATTENUATORS
RF AMPLIFIERS
LOW-PASS FILTERS
FIRST MIXER
RF OVERLOAD
DETECTOR
2200 MHZ
BANDPASS FILTE
SECOND OSCILLA
SECOND MIXER
2200 TO
4100 MHZ
SECOND LO
TUNING
YIG DRIVER
A1A3A5
FIRST LOCAL
OSCILLATOR
TUNING CONTROL
FROM RF
OVERLOAD DETECTOR
INTERCONNEC
BOARD
A1A4
NOISE DRIVE OUTPUT
RELAY POWER
LED'S
NOISE DRIVE VOLTAGE
RELAY POWER
NOISE DRIVE AND RELAY PWR LED'S
TTL
OUTPUT
R
KEYBOARD
A1A1A1
M
DISPLAYS
AND
METERS
A1A1A2
FRONT
PANEL
I/O
APU
A1A2A1
RAM
BBU RAM
A1A2A2
MICRO-
PROCESSOR
A1A2A3

Figure 7-1. OVERALL BLOCK DIAGRAM

SECTION 7

SCHEMATIC DRAWINGS

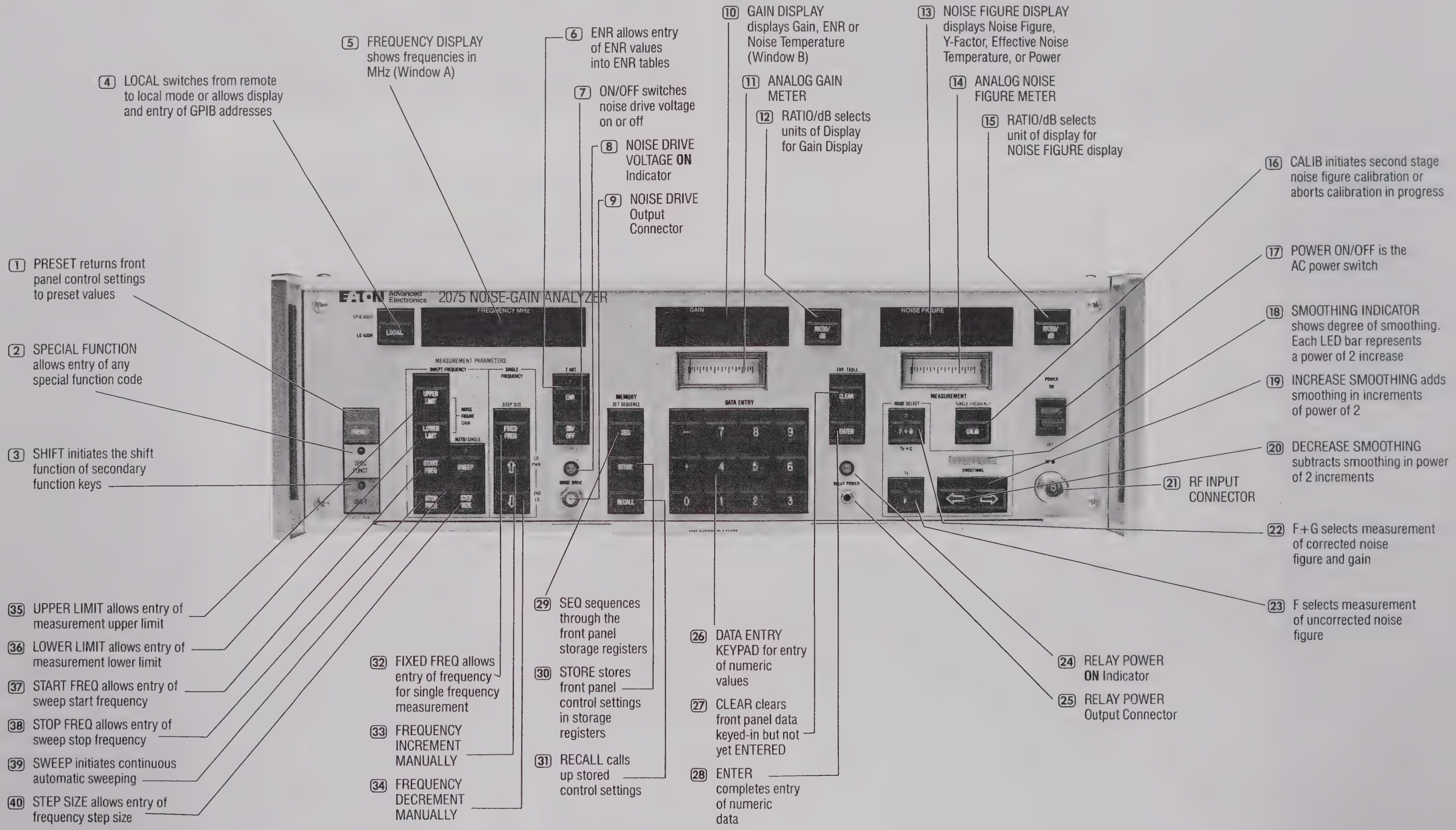

EATON Advanced Electronics
2075 NOISE-GAIN ANALYZER
FREQUENCY MHz
GAIN
NOISE FIGURE
MEASUREMENT PARAMETERS
DATA ENTRY
MEMORY
SMOOTHING
1 PRESET returns front panel control settings to preset values
2 SPECIAL FUNCTION allows entry of any special function code
3 SHIFT initiates the shift function of secondary function keys
4 LOCAL switches from remote to local mode or allows display and entry of GPIB addresses
5 FREQUENCY DISPLAY shows frequencies in MHz (Window A)
6 ENR allows entry of ENR values into ENR tables
7 ON/OFF switches noise drive voltage on or off
8 NOISE DRIVE VOLTAGE ON Indicator
9 NOISE DRIVE Output Connector
10 GAIN DISPLAY displays Gain, ENR or Noise Temperature (Window B)
11 ANALOG GAIN METER
12 RATIO/dB selects units of Display for Gain Display
13 NOISE FIGURE DISPLAY displays Noise Figure, Y-Factor, Effective Noise Temperature, or Power
14 ANALOG NOISE FIGURE METER
15 RATIO/dB selects unit of display for NOISE FIGURE display
16 CALIB initiates second stage noise figure calibration or aborts calibration in progress
17 POWER ON/OFF is the AC power switch
18 SMOOTHING INDICATOR shows degree of smoothing. Each LED bar represents a power of 2 increase
19 INCREASE SMOOTHING adds smoothing in increments of power of 2
20 DECREASE SMOOTHING subtracts smoothing in power of 2 increments
21 RF INPUT CONNECTOR
22 F+G selects measurement of corrected noise figure and gain
23 F selects measurement of uncorrected noise figure
24 RELAY POWER ON Indicator
25 RELAY POWER Output Connector
26 DATA ENTRY KEYPAD for entry of numeric values
27 CLEAR clears front panel data keyed-in but not yet ENTERED
28 ENTER completes entry of numeric data
29 SEQ sequences through the front panel storage registers
30 STORE stores front panel control settings in storage registers
31 RECALL calls up stored control settings
32 FIXED FREQ allows entry of frequency for single frequency measurement
33 FREQUENCY INCREMENT MANUALLY
34 FREQUENCY DECREMENT MANUALLY
35 UPPER LIMIT allows entry of measurement upper limit
36 LOWER LIMIT allows entry of measurement lower limit
37 START FREQ allows entry of sweep start frequency
38 STOP FREQ allows entry of sweep stop frequency
39 SWEEP initiates continuous automatic sweeping
40 STEP SIZE allows entry of frequency step size

Figure 3-1. 2075 FRONT PANEL CONTROLS AND INDICATORS

1-9. CONTROLS AND INDICATORS

The front panel controls and indicators, and their functions, are listed in Table 1-6.

Because the 2075 offers such a wide range of available functions, a single key may initiate two or more functions. The primary function of such a key is indicated by the key label or designation. For example, the key **START FREQ** is used to allow display or entry of the start frequency for a swept measurement. The primary function of a key is initiated by pressing that key once.

Where a key has a secondary function, this function is indicated by the orange lettering above, below, or beside the key. For example, the key **START FREQ** has a secondary function which allows display or entry of an IF frequency from an external mixer. Accordingly, the orange designation, IF, is located just to the left of the key. The secondary, or shift function of a key is initiated by pressing the orange **SHIFT** key first, and then the **FUNCTION** key. For example, to enter or display the IF frequency, press **SHIFT** and then **START FREQ**.

In addition to the primary and secondary functions, some keys have a tertiary function. The tertiary function of a key is specific to a particular mode of operation. While in that particular mode, pressing the **FUNCTION** key initates the tertiary function.

The 2075 front panel is designed so that where multiple keystrokes are required, the sequence is from left to right.

The keys of the numeric keypad are used for entry of numeric values. In all cases, the numeric entry is completed by pressing the **ENTER** key.

Table 1-6 lists the controls and indicators together with primary, secondary, and tertiary functions. The exact keystroke sequence for each function is also shown. Wherever functions or procedures are discussed in this manual, the applicable keystroke sequences are also included therein.

Table 1-7 lists the rear panel controls and connectors.

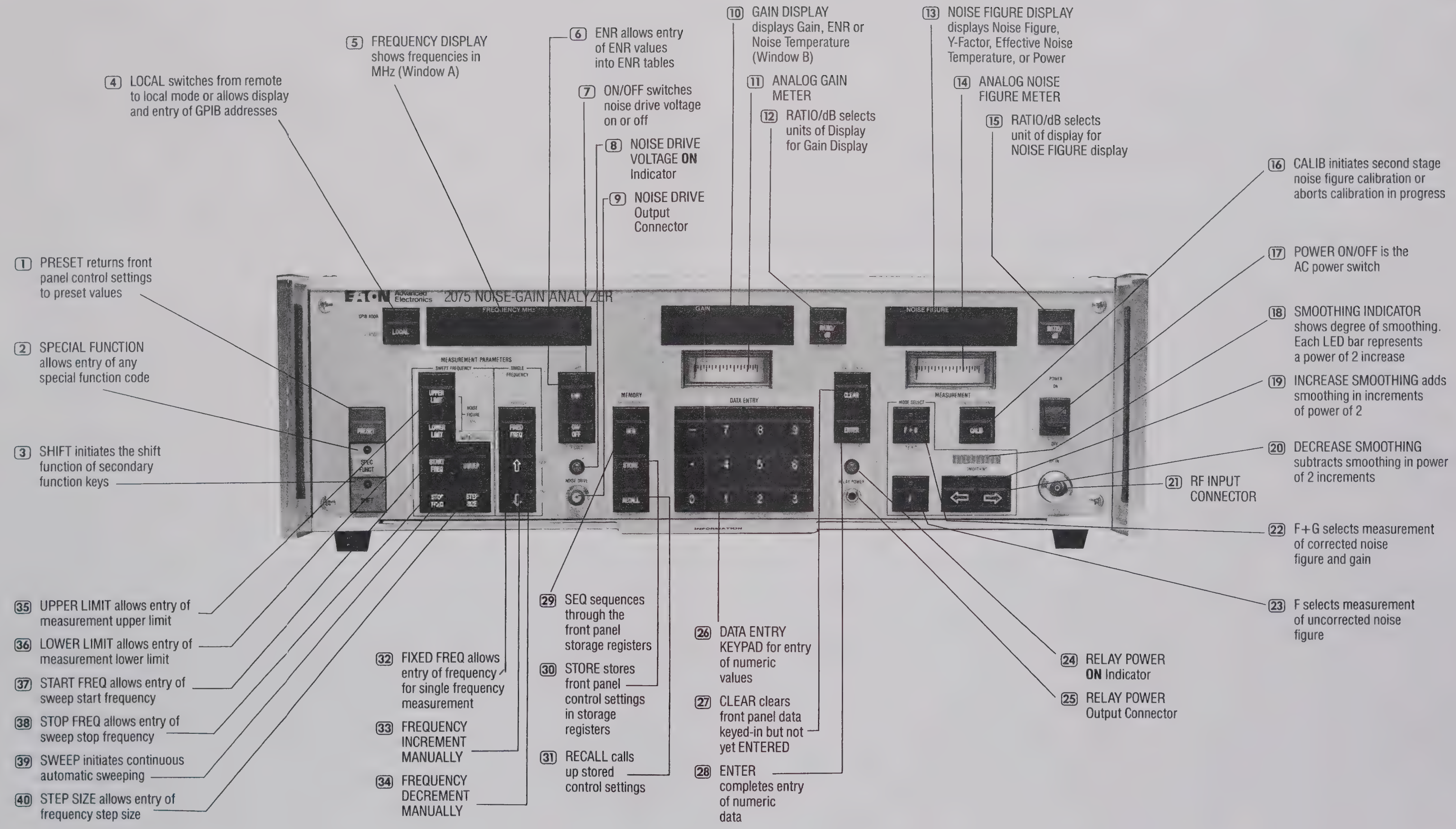
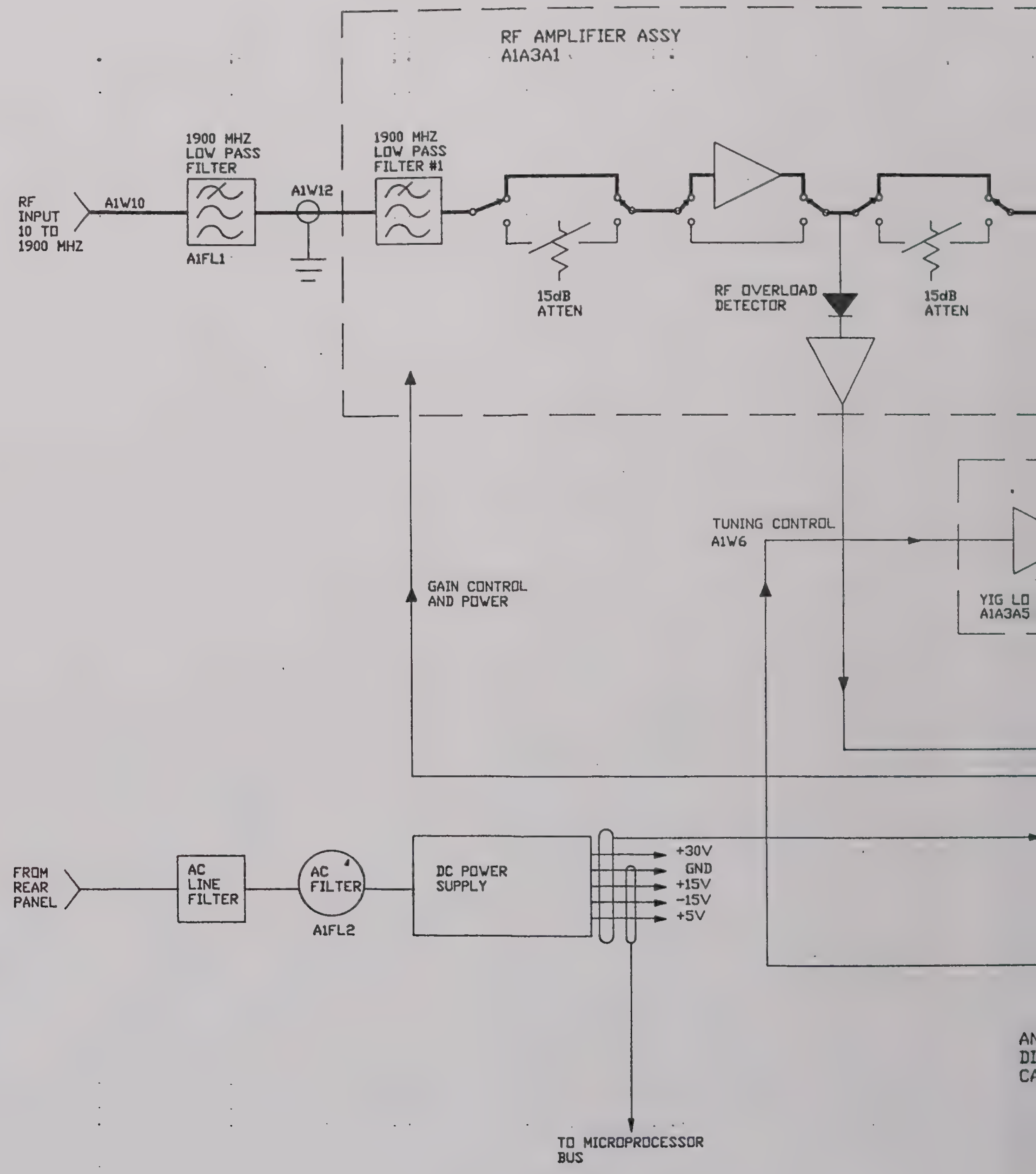

① PRESET returns front panel control settings to preset values
② SPECIAL FUNCTION allows entry of any special function code
③ SHIFT initiates the shift function of secondary function keys
④ LOCAL switches from remote to local mode or allows display and entry of GPIB addresses
⑤ FREQUENCY DISPLAY shows frequencies in MHz (Window A)
⑥ ENR allows entry of ENR values into ENR tables
⑦ ON/OFF switches noise drive voltage on or off
⑧ NOISE DRIVE VOLTAGE ON Indicator
⑨ NOISE DRIVE Output Connector
⑩ GAIN DISPLAY displays Gain, ENR or Noise Temperature (Window B)
⑪ ANALOG GAIN METER
⑫ RATIO/dB selects units of Display for Gain Display
⑬ NOISE FIGURE DISPLAY displays Noise Figure, Y-Factor, Effective Noise Temperature, or Power
⑭ ANALOG NOISE FIGURE METER
⑮ RATIO/dB selects unit of display for NOISE FIGURE display
⑯ CALIB initiates second stage noise figure calibration or aborts calibration in progress
⑰ POWER ON/OFF is the AC power switch
⑱ SMOOTHING INDICATOR shows degree of smoothing. Each LED bar represents a power of 2 increase
⑲ INCREASE SMOOTHING adds smoothing in increments of power of 2
⑳ DECREASE SMOOTHING subtracts smoothing in power of 2 increments
㉑ RF INPUT CONNECTOR
㉒ F+G selects measurement of corrected noise figure and gain
㉓ F selects measurement of uncorrected noise figure
㉔ RELAY POWER ON Indicator
㉕ RELAY POWER Output Connector
㉖ DATA ENTRY KEYPAD for entry of numeric values
㉗ CLEAR clears front panel data keyed-in but not yet ENTERED
㉘ ENTER completes entry of numeric data
㉙ SEQ sequences through the front panel storage registers
㉚ STORE stores front panel control settings in storage registers
㉛ RECALL calls up stored control settings
㉜ FIXED FREQ allows entry of frequency for single frequency measurement
㉝ FREQUENCY INCREMENT MANUALLY
㉞ FREQUENCY DECREMENT MANUALLY
㉟ UPPER LIMIT allows entry of measurement upper limit
㊱ LOWER LIMIT allows entry of measurement lower limit
㊲ START FREQ allows entry of sweep start frequency
㊳ STOP FREQ allows entry of sweep stop frequency
㊴ SWEEP initiates continuous automatic sweeping
㊵ STEP SIZE allows entry of frequency step size
E·A·T·N Advanced Electronics
2075 NOISE-GAIN ANALYZER
FREQUENCY MHz
GAIN
NOISE FIGURE
MEASUREMENT PARAMETERS
SWEPT FREQUENCY
SINGLE FREQUENCY
MEMORY
DATA ENTRY
MEASUREMENT
MODE SELECT
POWER
ON
OFF
RF IN
NOISE DRIVE
RELAY POWER
INFORMATION
PRESET
SPEC FUNCT
SHIFT
LOCAL
UPPER LIMIT
LOWER LIMIT
START FREQ
STOP FREQ
SWEEP
STEP SIZE
FIXED FREQ
ENR
ON OFF
SEQ
STORE
RECALL
CLEAR
ENTER
F+G
F
CALIB
RATIO/dB

Figure 1-1. 2075 FRONT PANEL CONTROLS AND INDICATORS


RF AMPLIFIER ASSY
A1A3A1
RF INPUT 10 TO 1900 MHZ
A1W10
1900 MHZ LOW PASS FILTER
A1FL1
A1W12
1900 MHZ LOW PASS FILTER #1
15dB ATTEN
RF OVERLOAD DETECTOR
15dB ATTEN
TUNING CONTROL
A1W6
YIG LO
A1A3A5
GAIN CONTROL AND POWER
FROM REAR PANEL
AC LINE FILTER
AC FILTER
A1FL2
DC POWER SUPPLY
+30V
GND
+15V
-15V
+5V
TO MICROPROCESSOR BUS

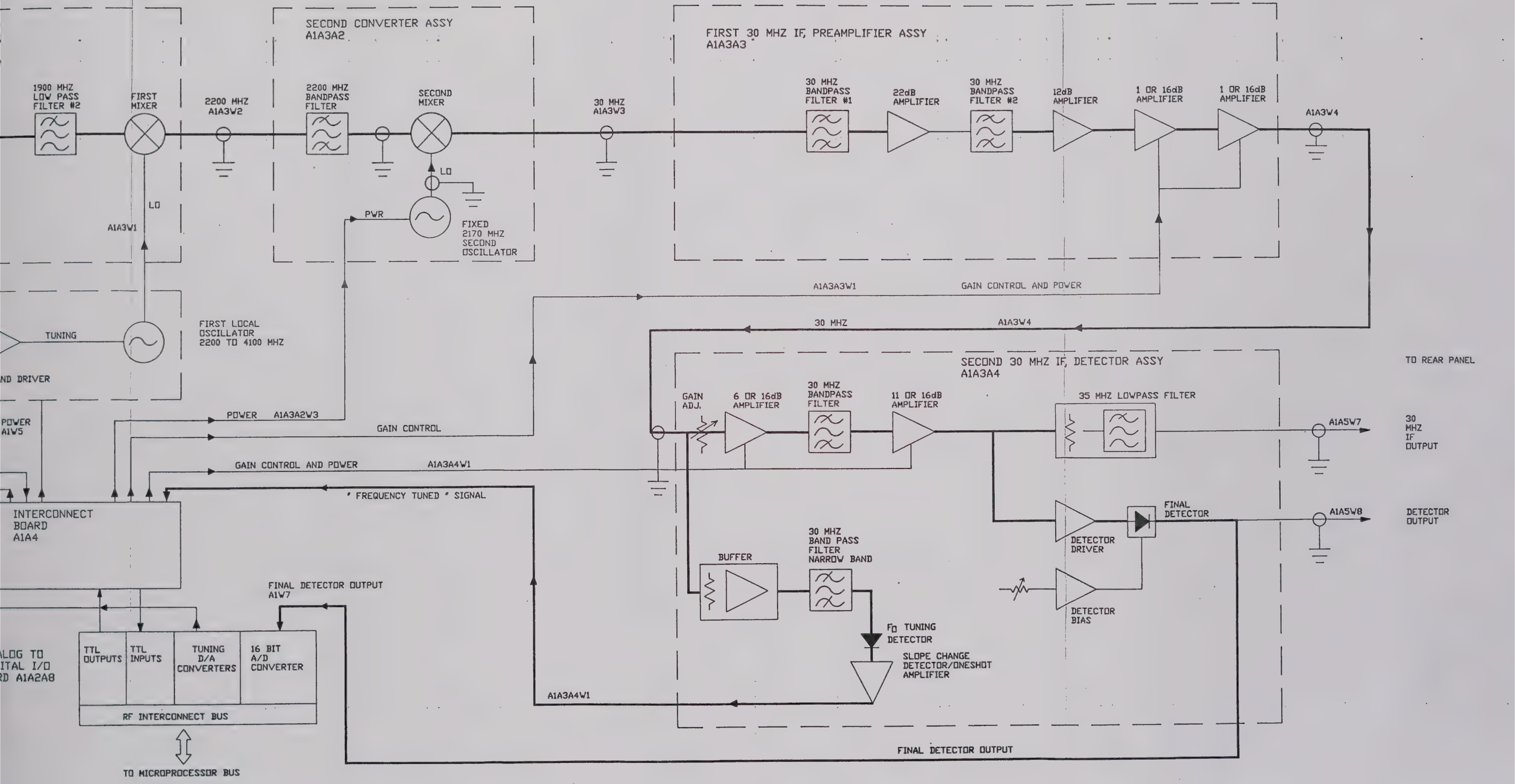

SECOND CONVERTER ASSY
A1A3A2
FIRST 30 MHZ IF, PREAMPLIFIER ASSY
A1A3A3
1900 MHZ LOW PASS FILTER #2
FIRST MIXER
2200 MHZ A1A3W2
2200 MHZ BANDPASS FILTER
SECOND MIXER
30 MHZ A1A3W3
30 MHZ BANDPASS FILTER #1
22dB AMPLIFIER
30 MHZ BANDPASS FILTER #2
12dB AMPLIFIER
1 OR 16dB AMPLIFIER
1 OR 16dB AMPLIFIER
A1A3W4
LO
A1A3W1
LO
PWR
FIXED 2170 MHZ SECOND OSCILLATOR
A1A3A3W1
GAIN CONTROL AND POWER
30 MHZ
A1A3W4
TUNING
FIRST LOCAL OSCILLATOR 2200 TO 4100 MHZ
ND DRIVER
SECOND 30 MHZ IF, DETECTOR ASSY
A1A3A4
TO REAR PANEL
GAIN ADJ.
6 OR 16dB AMPLIFIER
30 MHZ BANDPASS FILTER
11 OR 16dB AMPLIFIER
35 MHZ LOWPASS FILTER
A1A5W7
30 MHZ IF OUTPUT
POWER A1W5
POWER A1A3A2W3
GAIN CONTROL
GAIN CONTROL AND POWER A1A3A4W1
' FREQUENCY TUNED ' SIGNAL
INTERCONNECT BOARD A1A4
FINAL DETECTOR
A1A5W8
DETECTOR OUTPUT
DETECTOR DRIVER
DETECTOR BIAS
BUFFER
30 MHZ BAND PASS FILTER NARROW BAND
FINAL DETECTOR OUTPUT A1W7
F0 TUNING DETECTOR
SLOPE CHANGE DETECTOR/ONESHOT AMPLIFIER
LOG TO
ITAL I/O
D A1A2A8
TTL OUTPUTS
TTL INPUTS
TUNING D/A CONVERTERS
16 BIT A/D CONVERTER
RF INTERCONNECT BUS
A1A3A4W1
TO MICROPROCESSOR BUS
FINAL DETECTOR OUTPUT

Figure 7-2. RF SECTION BLOCK DIAGRAM

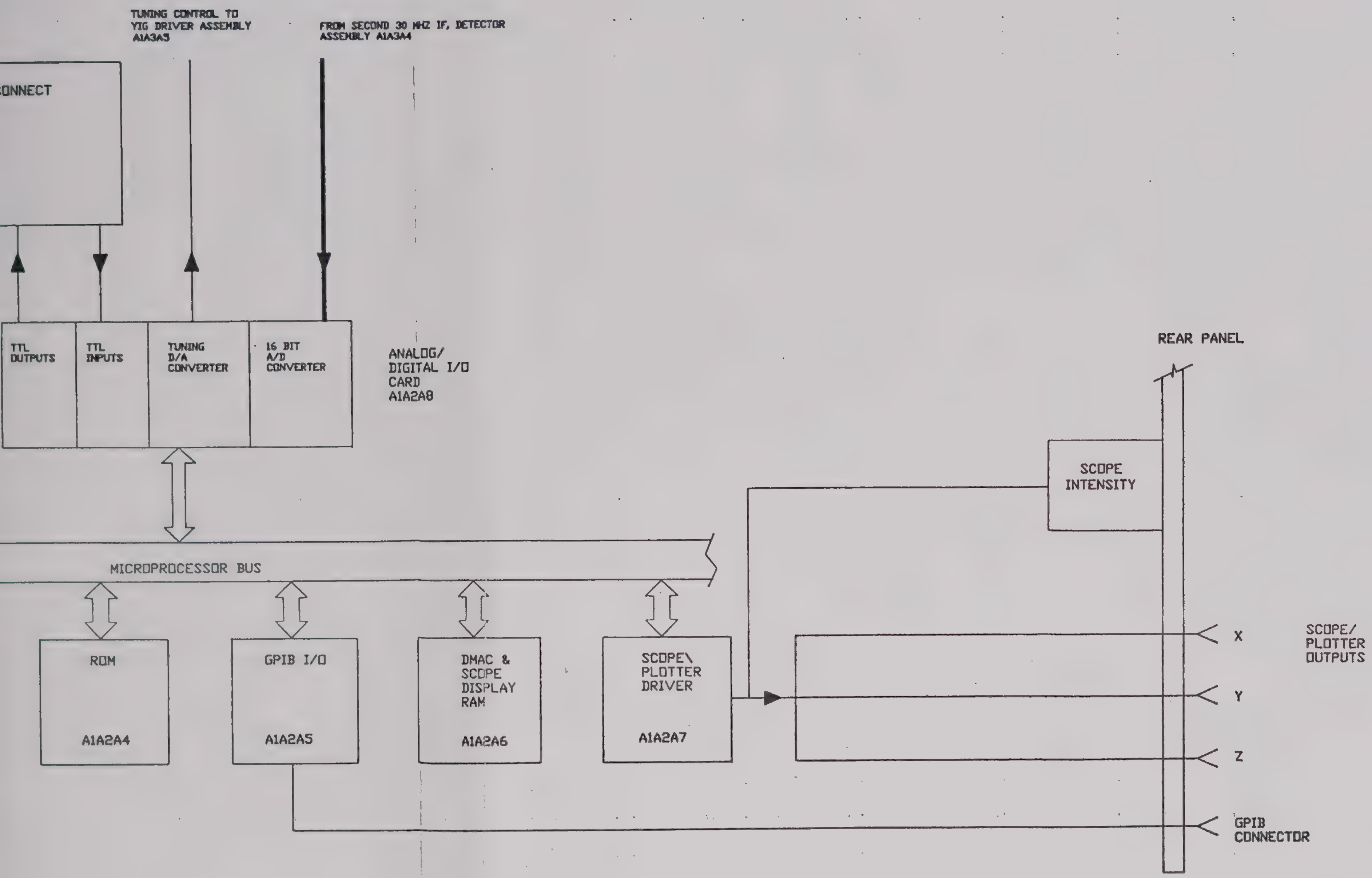
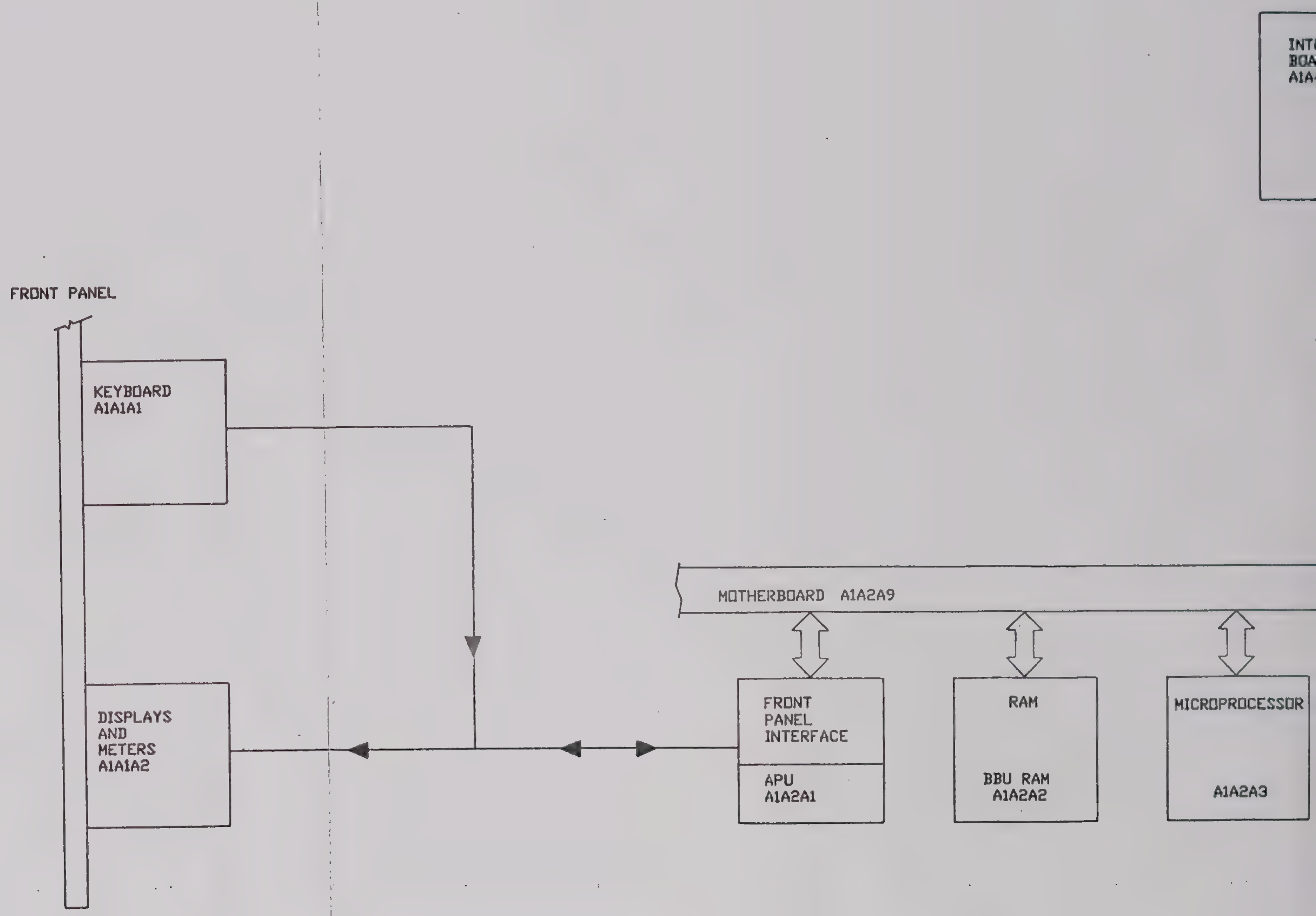

TUNING CONTROL TO YIG DRIVER ASSEMBLY A1A3A5
FROM SECOND 30 MHZ IF, DETECTOR ASSEMBLY A1A3A4
ONNECT
TTL OUTPUTS
TTL INPUTS
TUNING D/A CONVERTER
16 BIT A/D CONVERTER
ANALOG/ DIGITAL I/O CARD A1A2A8
MICROPROCESSOR BUS
ROM
A1A2A4
GPIB I/O
A1A2A5
DMAC & SCOPE DISPLAY RAM
A1A2A6
SCOPE\ PLOTTER DRIVER
A1A2A7
SCOPE INTENSITY
REAR PANEL
X
Y
Z
SCOPE/ PLOTTER OUTPUTS
GPIB CONNECTOR

Figure 7-3. DIGITAL SECTION BLOCK DIAGRAM


FRONT PANEL
KEYBOARD A1A1A1
DISPLAYS AND METERS A1A1A2
MOTHERBOARD A1A2A9
FRONT PANEL INTERFACE
APU A1A2A1
RAM
BBU RAM A1A2A2
MICROPROCESSOR
A1A2A3
INT
BOA
A1A

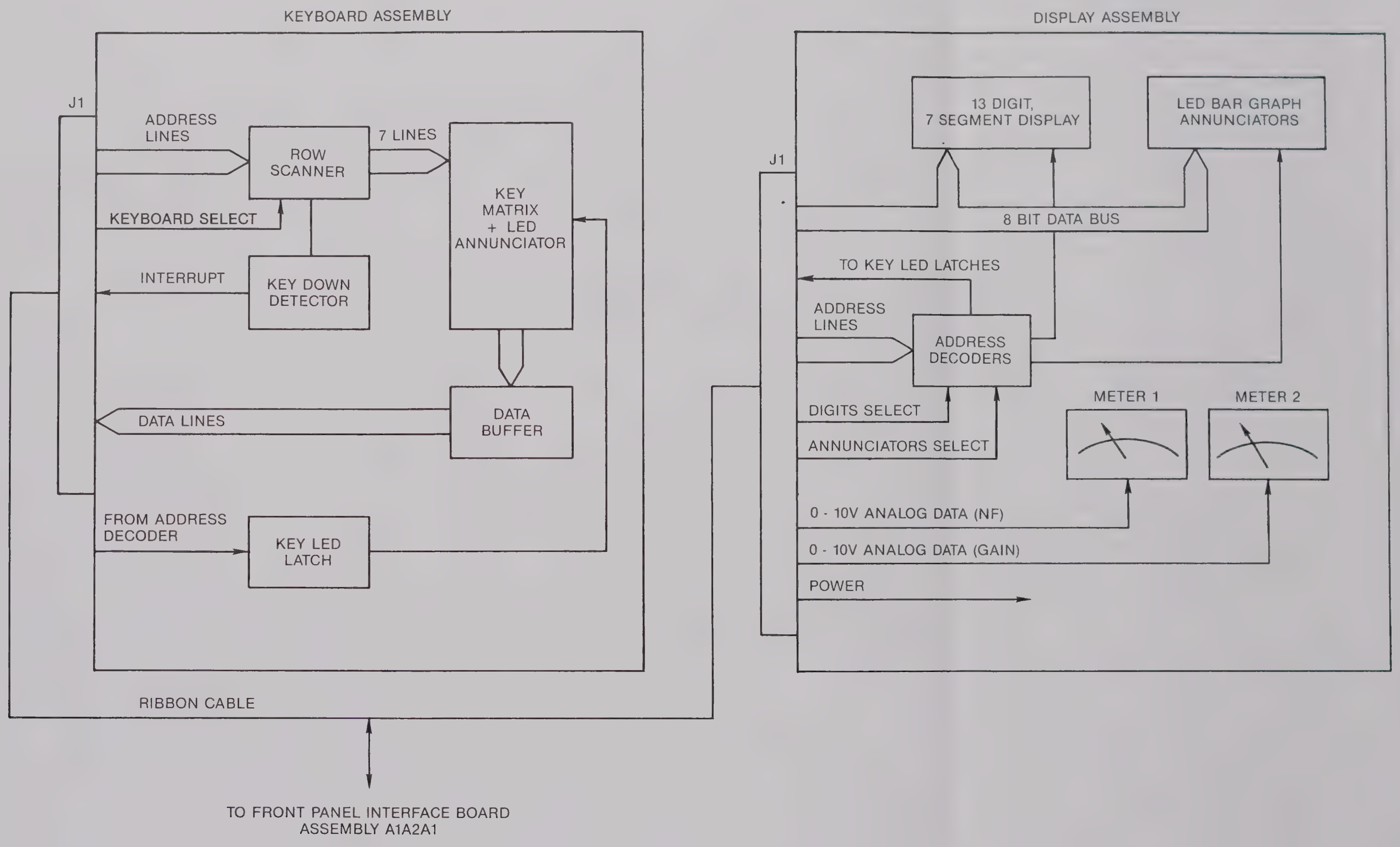
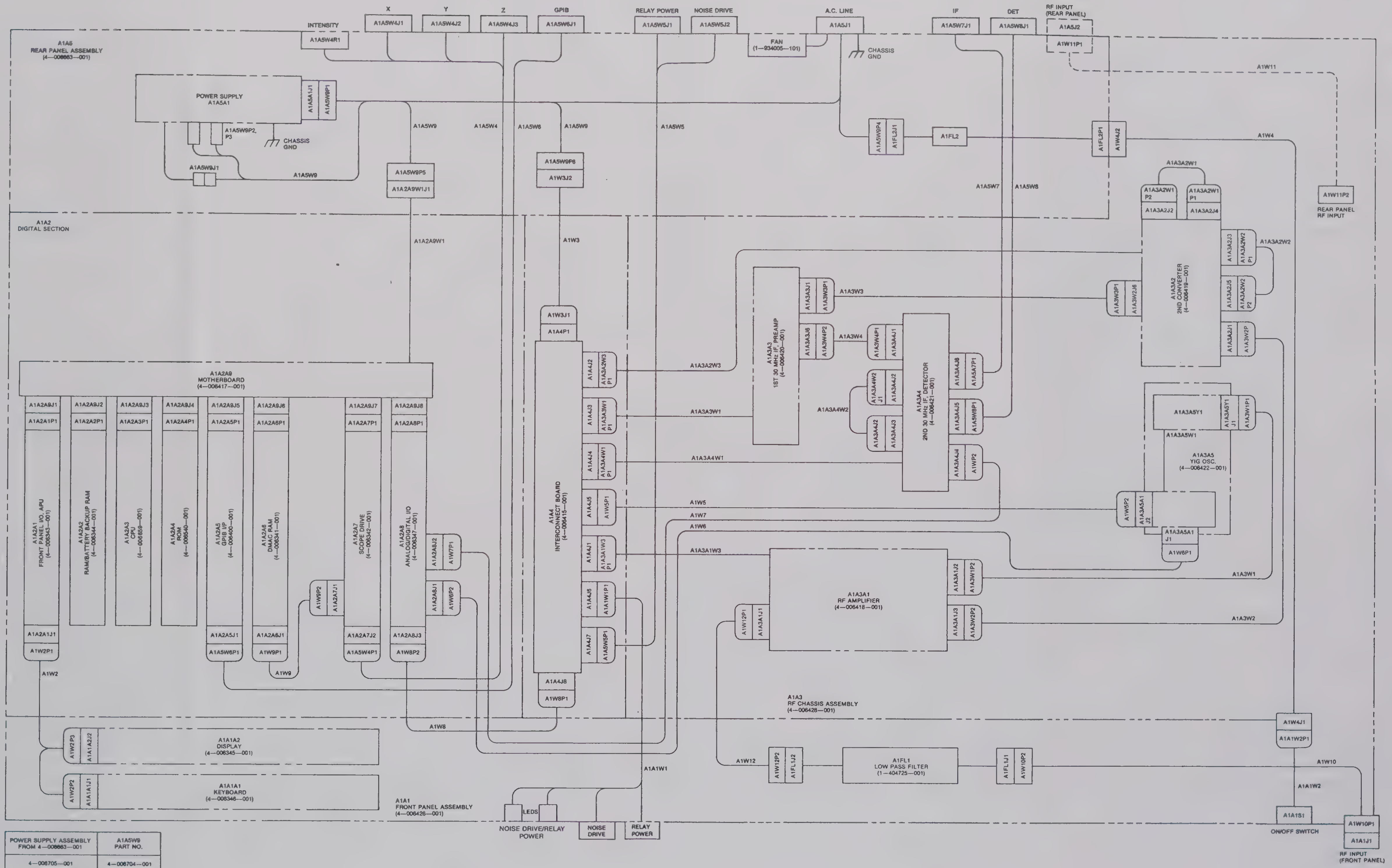

KEYBOARD ASSEMBLY
J1
ADDRESS LINES
ROW SCANNER
7 LINES
KEY MATRIX + LED ANNUNCIATOR
KEYBOARD SELECT
INTERRUPT
KEY DOWN DETECTOR
DATA LINES
DATA BUFFER
FROM ADDRESS DECODER
KEY LED LATCH
RIBBON CABLE
TO FRONT PANEL INTERFACE BOARD ASSEMBLY A1A2A1
DISPLAY ASSEMBLY
13 DIGIT, 7 SEGMENT DISPLAY
LED BAR GRAPH ANNUNCIATORS
J1
8 BIT DATA BUS
TO KEY LED LATCHES
ADDRESS LINES
ADDRESS DECODERS
DIGITS SELECT
ANNUNCIATORS SELECT
METER 1
METER 2
0 - 10V ANALOG DATA (NF)
0 - 10V ANALOG DATA (GAIN)
POWER

Figure 7-4. KEYBOARD AND DISPLAY SECTION BLOCK DIAGRAM


INTENSITY
A1A5W4R1
X
A1A5W4J1
Y
A1A5W4J2
Z
A1A5W4J3
GPIB
A1A5W6J1
RELAY POWER
A1A5W5J1
NOISE DRIVE
A1A5W5J2
FAN
(1—934005—101)
A.C. LINE
A1A5J1
CHASSIS GND
IF
A1A5W7J1
DET
A1A5W8J1
RF INPUT
(REAR PANEL)
A1A5J2
A1W11P1
A1W11
A1A5
REAR PANEL ASSEMBLY
(4—008663—001)
POWER SUPPLY
A1A5A1
A1A5A1J1
A1A5W9P1
A1A5W9P2,
P3
CHASSIS
GND
A1A5W9J1
A1A5W9
A1A5W9
A1A5W4
A1A5W6
A1A5W9
A1A5W5
A1A5W9P5
A1A2A9W1J1
A1A5W9P6
A1W3J2
A1A5W9P4
A1FL2J1
A1FL2
A1FL2P1
A1W4J2
A1W4
A1A5W7
A1A5W8
A1W11P2
REAR PANEL
RF INPUT
A1A2
DIGITAL SECTION
A1A2A9W1
A1W3
A1A2A9
MOTHERBOARD
(4—006417—001)
A1A2A9J1
A1A2A1P1
A1A2A9J2
A1A2A2P1
A1A2A9J3
A1A2A3P1
A1A2A9J4
A1A2A4P1
A1A2A9J5
A1A2A5P1
A1A2A9J6
A1A2A6P1
A1A2A9J7
A1A2A7P1
A1A2A9J8
A1A2A8P1
A1A2A1
FRONT PANEL I/O, APU
(4—006343—001)
A1A2A2
RAM/BATTERY BACKUP RAM
(4—006344—001)
A1A2A3
CPU
(4—006659—001)
A1A2A4
ROM
(4—006540—001)
A1A2A5
GPIB I/P
(4—006400—001)
A1A2A6
DMAC RAM
(4—006341—001)
A1A2A7
SCOPE DRIVE
(4—006342—001)
A1A2A8
ANALOG/DIGITAL I/O
(4—006347—001)
A1A2A8J2
A1W7P1
A1A2A8J1
A1W6P2
A1W9P2
A1A2A7J1
A1A2A1J1
A1W2P1
A1W2
A1A2A5J1
A1A5W6P1
A1A2A6J1
A1W9P1
A1W9
A1A2A7J2
A1A5W4P1
A1A2A8J3
A1W8P2
A1W8
A1W3J1
A1A4P1
A1A4
INTERCONNECT BOARD
(4—008415—001)
A1A4J2
A1A3A2W3
P1
A1A4J3
A1A3A3W1
P1
A1A4J4
A1A3A4W1
P1
A1A4J5
A1W5P1
A1A4J1
A1A3A1W3
P1
A1A4J6
A1A1W1P1
A1A4J7
A1A5W5P1
A1A4J8
A1W8P1
A1A3A2W3
A1A3A3W1
A1A3A4W1
A1W5
A1W7
A1W6
A1A3A1W3
A1A3A3
1ST 30 MHz IF, PREAMP
(4—006420—001)
A1A3A3J1
A1A3W3P1
A1A3W3
A1A3A3J6
A1A3W4P2
A1A3W4
A1A3W4P1
A1A3A4J1
A1A3A4W2
J1
A1A3A4J2
A1A3A4W2
A1A3A4J2
A1A3A4J3
A1A3A4
2ND 30 MHz IF, DETECTOR
(4—006421—001)
A1A3A4J8
A1A5A7P1
A1A3A4J5
A1A5W8P1
A1A3A4J4
A1WP2
A1A3A1
RF AMPLIFIER
(4—006418—001)
A1W12P1
A1A3A1J1
A1A3A1J2
A1A3W1P2
A1A3A1J3
A1A3W2P2
A1A3
RF CHASSIS ASSEMBLY
(4—006428—001)
A1A3A2W1
A1A3A2W1
P2
A1A3A2J2
A1A3A2W1
P1
A1A3A2J4
A1A3A2
2ND CONVERTER
(4—006419—001)
A1A3W3P1
A1A3W2J6
A1A3A2J3
A1A3A2W2
P1
A1A3A2W2
A1A3A2J5
A1A3A2W2
P2
A1A3A2J1
A1A3W2P
A1A3A5Y1
A1A3A5Y1
J1
A1A3W1P1
A1A3A5W1
A1A3A5
YIG OSC.
(4—006422—001)
A1W5P2
A1A3A5A1
J2
A1A3A5A1
J1
A1W6P1
A1A3W1
A1A3W2
A1W4J1
A1A1W2P1
A1W10
A1A1W2
A1A1S1
ON/OFF SWITCH
A1W10P1
A1A1J1
RF INPUT
(FRONT PANEL)
A1W12
A1W12P2
A1FL1J2
A1FL1
LOW PASS FILTER
(1—404725—001)
A1FL1J1
A1W10P2
A1A1W1
A1W2P3
A1A1A2J2
A1A1A2
DISPLAY
(4—006345—001)
A1W2P2
A1A1A1J1
A1A1A1
KEYBOARD
(4—006346—001)
A1A1
FRONT PANEL ASSEMBLY
(4—006426—001)
LEDS
NOISE DRIVE/RELAY
POWER
NOISE
DRIVE
RELAY
POWER

POWER SUPPLY ASSEMBLY FROM 4—008663—001	A1A5W9 PART NO.
4—008705—001	4—008704—001

Figure 7-5. CABLING DIAGRAM

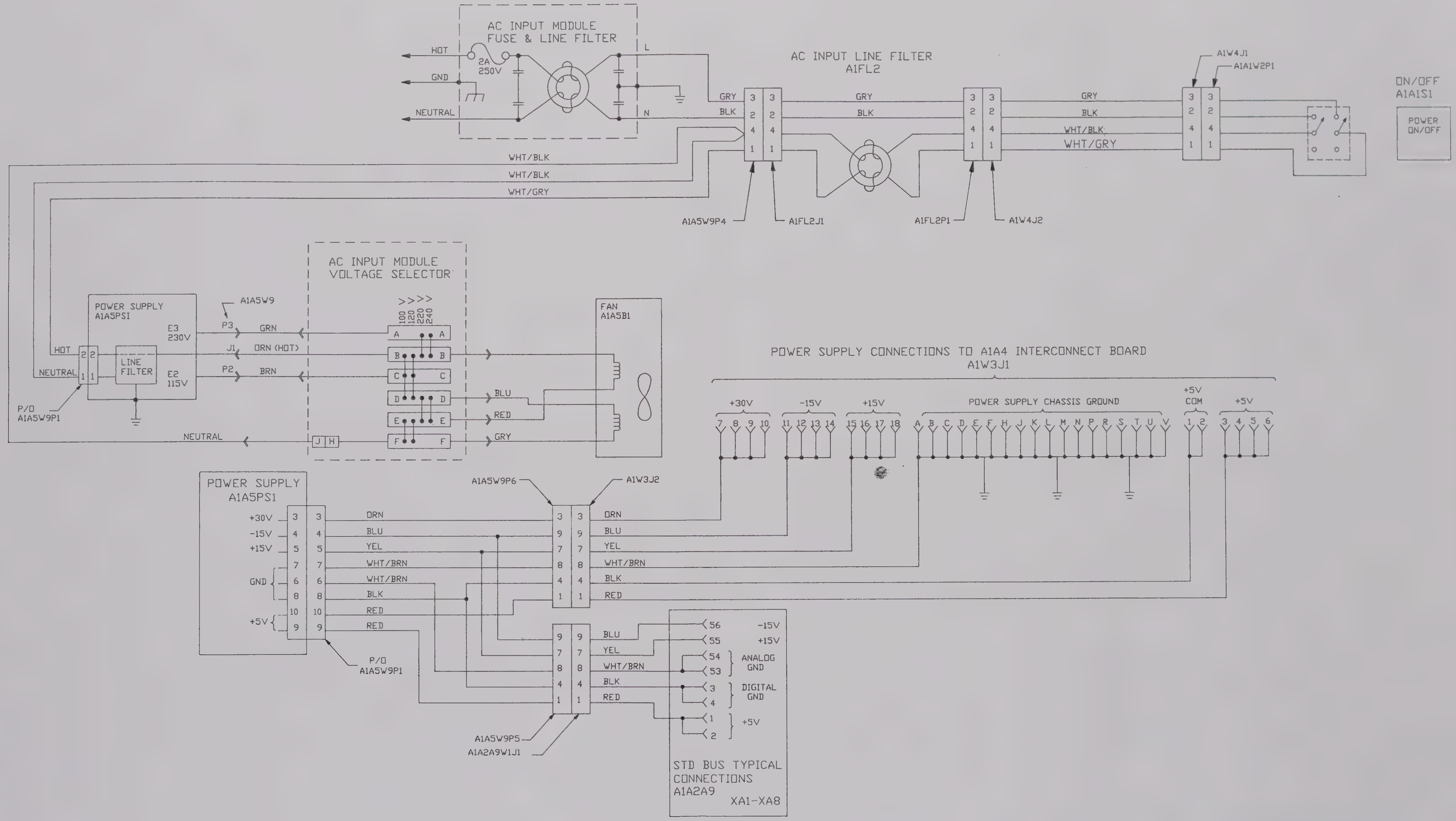
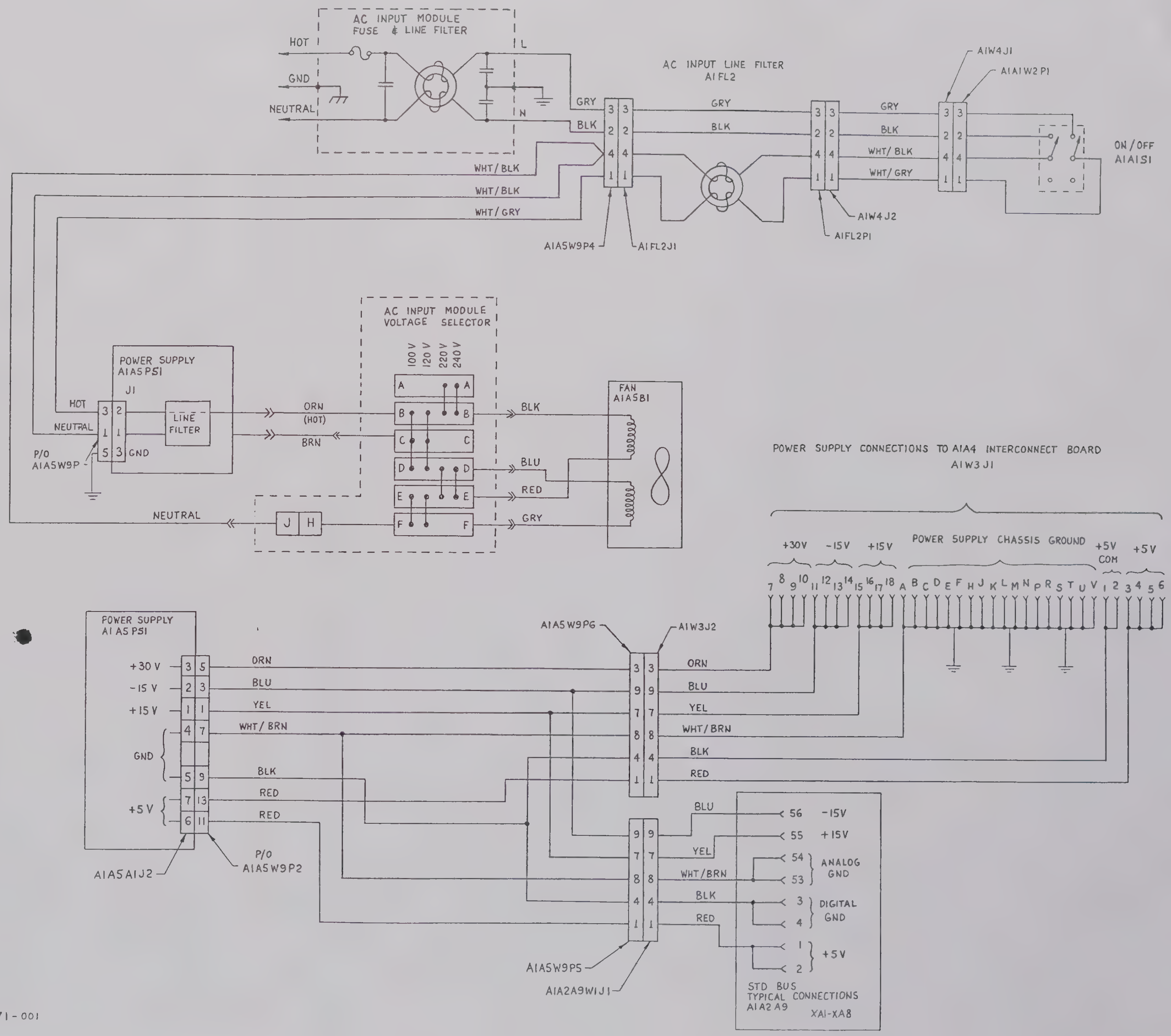

AC INPUT MODULE FUSE & LINE FILTER
HOT
GND
NEUTRAL
2A 250V
L
N
AC INPUT LINE FILTER A1FL2
GRY
BLK
WHT/BLK
WHT/GRY
A1W4J1
A1A1W2P1
ON/OFF A1A1S1
POWER ON/OFF
A1A5W9P4
A1FL2J1
A1FL2P1
A1W4J2
AC INPUT MODULE VOLTAGE SELECTOR
100 120 220 240
A B C D E F
J H
POWER SUPPLY A1A5PS1
LINE FILTER
E3 230V
E2 115V
P/O A1A5W9P1
A1A5W9
P3
J1
P2
GRN
ORN (HOT)
BRN
BLU
RED
GRY
FAN A1A5B1
POWER SUPPLY CONNECTIONS TO A1A4 INTERCONNECT BOARD A1W3J1
+30V
-15V
+15V
POWER SUPPLY CHASSIS GROUND
+5V COM
+5V
7 8 9 10 11 12 13 14 15 16 17 18
A B C D E F H J K L M N P R S T U V
1 2 3 4 5 6
POWER SUPPLY A1A5PS1
+30V
-15V
+15V
GND
+5V
ORN
BLU
YEL
WHT/BRN
BLK
RED
A1A5W9P6
A1W3J2
A1A5W9P5
A1A2A9W1J1
STD BUS TYPICAL CONNECTIONS A1A2A9
XA1-XA8
56 -15V
55 +15V
54 53 ANALOG GND
3 4 DIGITAL GND
1 2 +5V

Figure 7-6. POWER DISTRIBUTION DIAGRAM–(USING POWERTEC P/S)

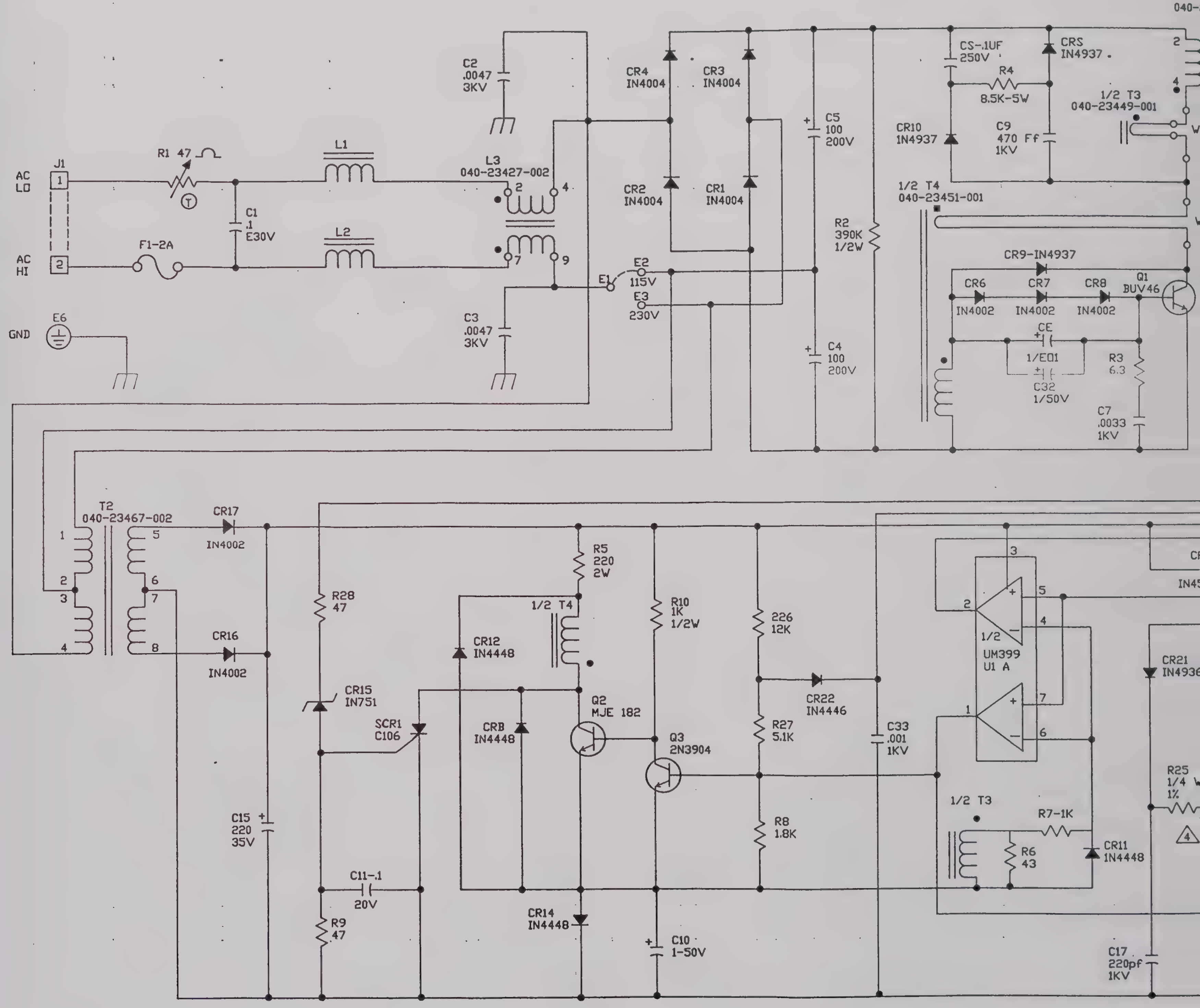


AC INPUT MODULE FUSE & LINE FILTER
HOT
GND
NEUTRAL
L
N
GRY
BLK
WHT/BLK
WHT/BLK
WHT/GRY
A1A5W9P4
A1FL2J1
AC INPUT LINE FILTER A1FL2
A1W4J2
A1FL2P1
A1W4J1
A1A1W2P1
ON/OFF A1A1S1
AC INPUT MODULE VOLTAGE SELECTOR
100 V
120 V
220 V
240 V
A
B
C
D
E
F
J
H
POWER SUPPLY A1A5PS1
J1
HOT
NEUTRAL
GND
LINE FILTER
P/O A1A5W9P
ORN (HOT)
BRN
BLU
RED
FAN A1A5B1
NEUTRAL
POWER SUPPLY CONNECTIONS TO A1A4 INTERCONNECT BOARD A1W3J1
+30V
-15V
+15V
POWER SUPPLY CHASSIS GROUND
+5V COM
+5V
7 8 9 10 11 12 13 14 15 16 17 18 A B C D E F H J K L M N P R S T U V 1 2 3 4 5 6
POWER SUPPLY A1 A5 PS1
+30 V
-15 V
+15 V
GND
+5 V
ORN
YEL
WHT/BRN
A1A5A1J2
P/O A1A5W9P2
A1A5W9P6
A1W3J2
A1A5W9P5
A1A2A9W1J1
56 -15V
55 +15V
54
53
ANALOG GND
3
4
DIGITAL GND
1
2
+5V
STD BUS TYPICAL CONNECTIONS A1A2A9 XA1-XA8

POWER DISTRIBUTION	
2075 SER. No.	SCHEMATIC No
101-285	4-501951-001
286-378	4-501952-001
379-UP	4-502000-001

1. POWER SUPPLY IS SUMMIT EATON P.N. 1-404771-001

Figure 7-6(a). POWER DISTRIBUTION DIAGRAM – SUMMIT


AC LO
AC HI
GND
J1
1
2
E6
R1 47
F1-2A
C1 .1 E30V
L1
L2
L3 040-23427-002
2
4
7
9
C2 .0047 3KV
C3 .0047 3KV
E1
E2 115V
E3 230V
CR4 IN4004
CR3 IN4004
CR2 IN4004
CR1 IN4004
C5 100 200V
C4 100 200V
R2 390K 1/2W
CS-.1UF 250V
R4 8.5K-5W
CRS IN4937
CR10 IN4937
C9 470 Ff 1KV
1/2 T3 040-23449-001
1/2 T4 040-23451-001
CR9-IN4937
CR6 IN4002
CR7 IN4002
CR8 IN4002
Q1 BUV46
CE 1/E01
C32 1/50V
R3 6.3
C7 .0033 1KV
040-
T2 040-23467-002
1
2
3
4
5
6
7
8
CR17 IN4002
CR16 IN4002
R28 47
CR15 IN751
SCR1 C106
C15 220 35V
C11-.1 20V
R9 47
R5 220 2W
1/2 T4
CR12 IN4448
CRB IN4448
Q2 MJE 182
Q3 2N3904
CR14 IN4448
R10 1K 1/2W
C10 1-50V
226 12K
R27 5.1K
R8 1.8K
CR22 IN4446
C33 .001 1KV
1/2 UM399 U1 A
1
2
3
4
5
6
7
1/2 T3
R6 43
R7-1K
CR11 IN4448
C17 220pf 1KV
CR21 IN4936
R25 1/4 W 1%
4

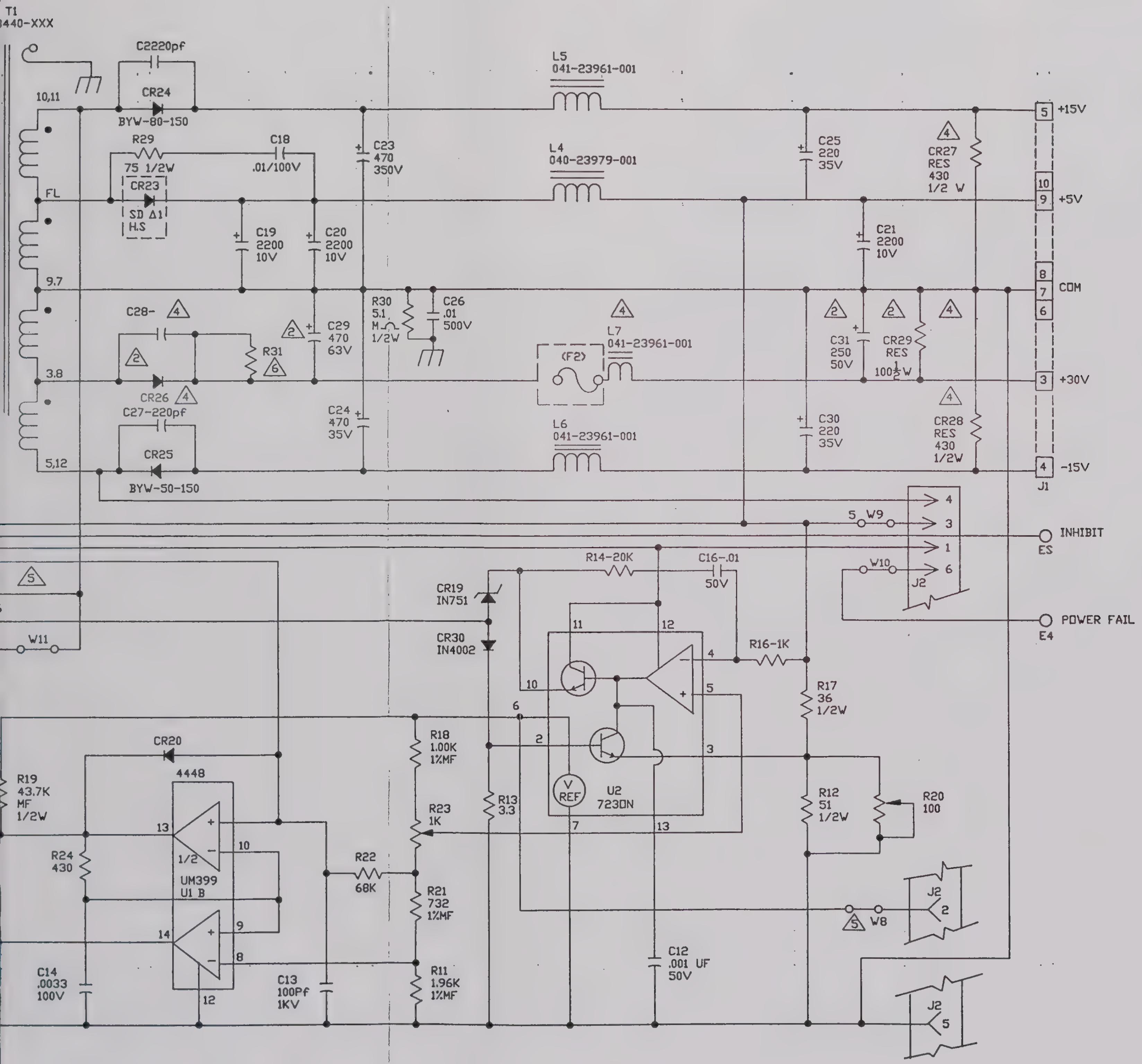
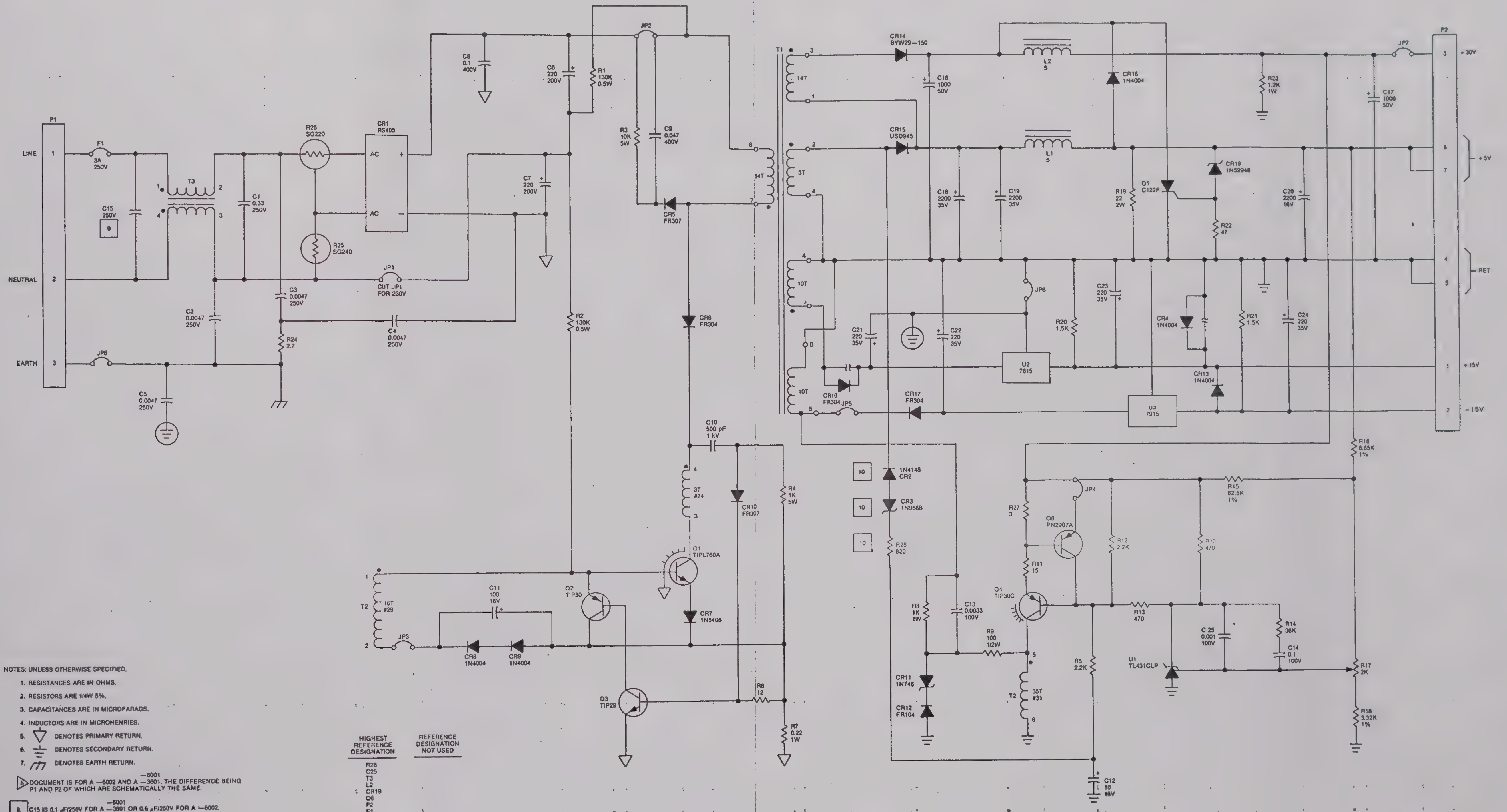

T1
3440-XXX
C2220pf
CR24
BYW-80-150
10,11
R29
75 1/2W
C18
.01/100V
CR23
SD Δ1
H.S
FL
C19
2200
10V
C20
2200
10V
C23
470
350V
9.7
C28-
R31
C29
470
63V
R30
5.1
M
1/2W
C26
.01
500V
3.8
CR26
C27-220pf
C24
470
35V
CR25
BYW-50-150
5,12
L5
041-23961-001
L4
040-23979-001
L7
041-23961-001
(F2)
L6
041-23961-001
C25
220
35V
C21
2200
10V
C31
250
50V
CR29
RES
100½W
C30
220
35V
CR27
RES
430
1/2 W
CR28
RES
430
1/2W
5
10
9
8
7
6
3
4
J1
+15V
+5V
COM
+30V
-15V
4
3
1
6
J2
5 W9
W10
INHIBIT
E5
POWER FAIL
E4
W11
CR19
IN751
CR30
IN4002
R14-20K
C16-.01
50V
11
12
4
5
10
2
3
6
7
13
R16-1K
R17
36
1/2W
V
REF
U2
723DN
R13
3.3
R18
1.00K
1%MF
R23
1K
R22
68K
R21
732
1%MF
R11
1.96K
1%MF
R12
51
1/2W
R20
100
C12
.001 UF
50V
J2
2
W8
J2
5
CR20
4448
R19
43.7K
MF
1/2W
R24
430
13
10
1/2
UM399
U1 B
9
14
8
12
C14
.0033
100V
C13
100Pf
1KV

Figure 7-7. POWERTEC POWER SUPPLY SCHEMATIC


P1
LINE 1
NEUTRAL 2
EARTH 3
F1 3A 250V
C15 250V 9
T3
C1 0.33 250V
C2 0.0047 250V
C3 0.0047 250V
C4 0.0047 250V
C5 0.0047 250V
JP8
R24 2.7
R26 SG220
R25 SG240
CR1 RS405
AC
JP1 CUT JP1 FOR 230V
C7 220 200V
C8 0.1 400V
C6 220 200V
R1 130K 0.5W
R2 130K 0.5W
JP2
R3 10K 5W
C9 0.047 400V
CR5 FR307
CR6 FR304
84T
C10 500 pF 1 kV
3T #24
CR10 FR307
R4 1K 5W
Q1 TIPL760A
CR7 1N5406
T2 16T #29
JP3
C11 100 16V
CR8 1N4004
CR9 1N4004
Q2 TIP30
Q3 TIP29
R8 12
R7 0.22 1W
T1
14T
3T
10T
10T
CR14 BYW29—150
C16 1000 50V
L2 5
CR18 1N4004
R23 1.2K 1W
C17 1000 50V
JP7
P2
+30V
+5V
RET
+15V
−15V
CR15 USD945
L1 5
C18 2200 35V
C19 2200 35V
R19 22 2W
Q5 C122F
CR19 1N5994B
R22 47
C20 2200 16V
JP6
C23 220 35V
R20 1.5K
U2 7815
U3 7915
CR4 1N4004
CR13 1N4004
R21 1.5K
C24 220 35V
C21 220 35V
C22 220 35V
CR16 FR304 JP5
CR17 FR304
R18 6.65K 1%
CR2 1N4148
CR3 1N968B
R28 820
10
JP4
R15 82.5K 1%
R27 3
Q6 PN2907A
R12 2.2K
R10 470
R11 15
Q4 TIP30C
R8 1K 1W
C13 0.0033 100V
R9 100 1/2W
T2 35T #31
R13 470
R14 36K
C 25 0.001 100V
C14 0.1 100V
R5 2.2K
U1 TL431CLP
R17 2K
R16 3.32K 1%
CR11 1N746
CR12 FR104
C12 10 16V

NOTES: UNLESS OTHERWISE SPECIFIED.

1. RESISTANCES ARE IN OHMS.
2. RESISTORS ARE 1/4W 5%.
3. CAPACITANCES ARE IN MICROFARADS.
4. INDUCTORS ARE IN MICROHENRIES.
5. ▽ DENOTES PRIMARY RETURN.
6. ⏚ DENOTES SECONDARY RETURN.
7. ⫽ DENOTES EARTH RETURN.

▷8 DOCUMENT IS FOR A —6002 AND A $\overset{—6001}{—3601}$. THE DIFFERENCE BEING P1 AND P2 OF WHICH ARE SCHEMATICALLY THE SAME.

9. C15 IS 0.1 μF/250V FOR A $\overset{—6001}{—3601}$ OR 0.6 μF/250V FOR A —6002.

10 CR2, CR3, AND R28 ARE USED ON THE —6002 MODEL ONLY.

HIGHEST REFERENCE DESIGNATION	REFERENCE DESIGNATION NOT USED
R28	
C25	
T3	
L2	
CR19	
Q6	
P2	
F1	
U3	
JP8	

Figure 7-8. SUMMIT POWER SUPPLY SCHEMATIC

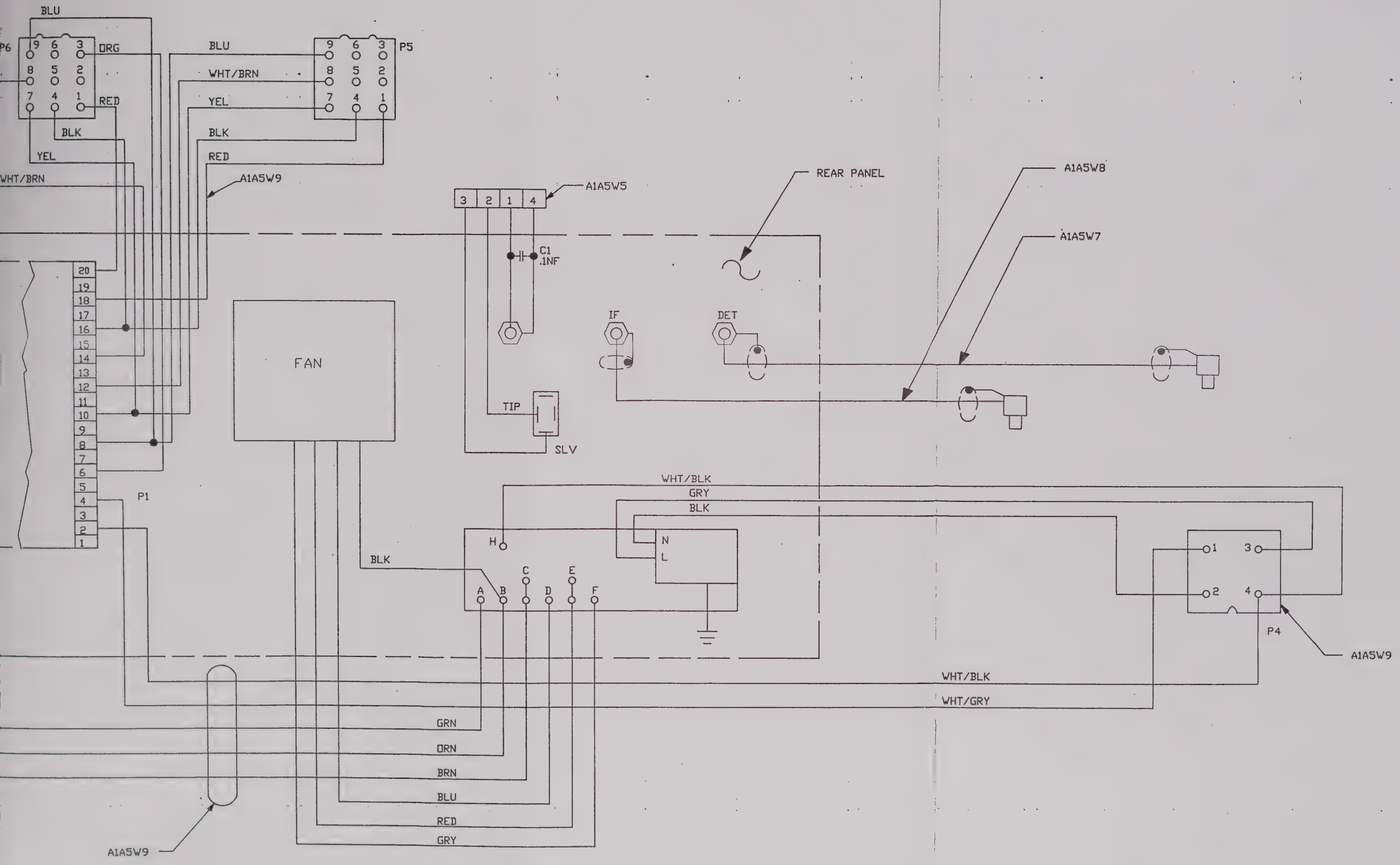
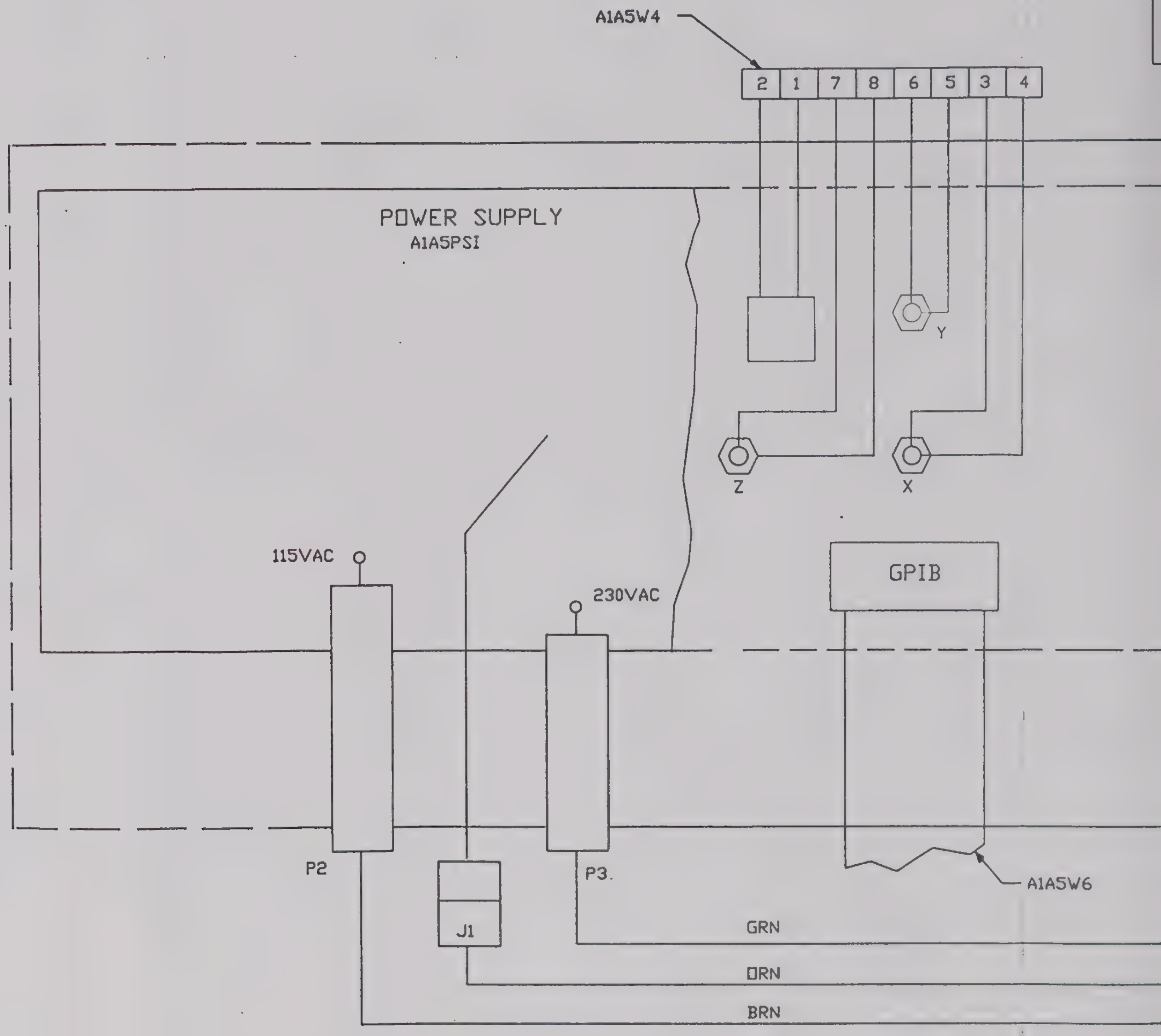

P6
P5
P4
P1
BLU
ORG
RED
BLK
YEL
WHT/BRN
A1A5W9
A1A5W5
A1A5W8
A1A5W7
REAR PANEL
C1
.1NF
IF
DET
TIP
SLV
FAN
WHT/BLK
GRY
BLK
H
N
L
A
B
C
D
E
F
WHT/GRY
GRN
ORN
BRN
RED
GRY

Figure 7-9. REAR PANEL ASSEMBLY–(WITH POWERTEC SUPPLY)


A1A5W4
2
1
7
8
6
5
3
4
POWER SUPPLY
A1A5PSI
Y
Z
X
GPIB
115VAC
230VAC
P2
J1
P3.
A1A5W6
GRN
ORN
BRN

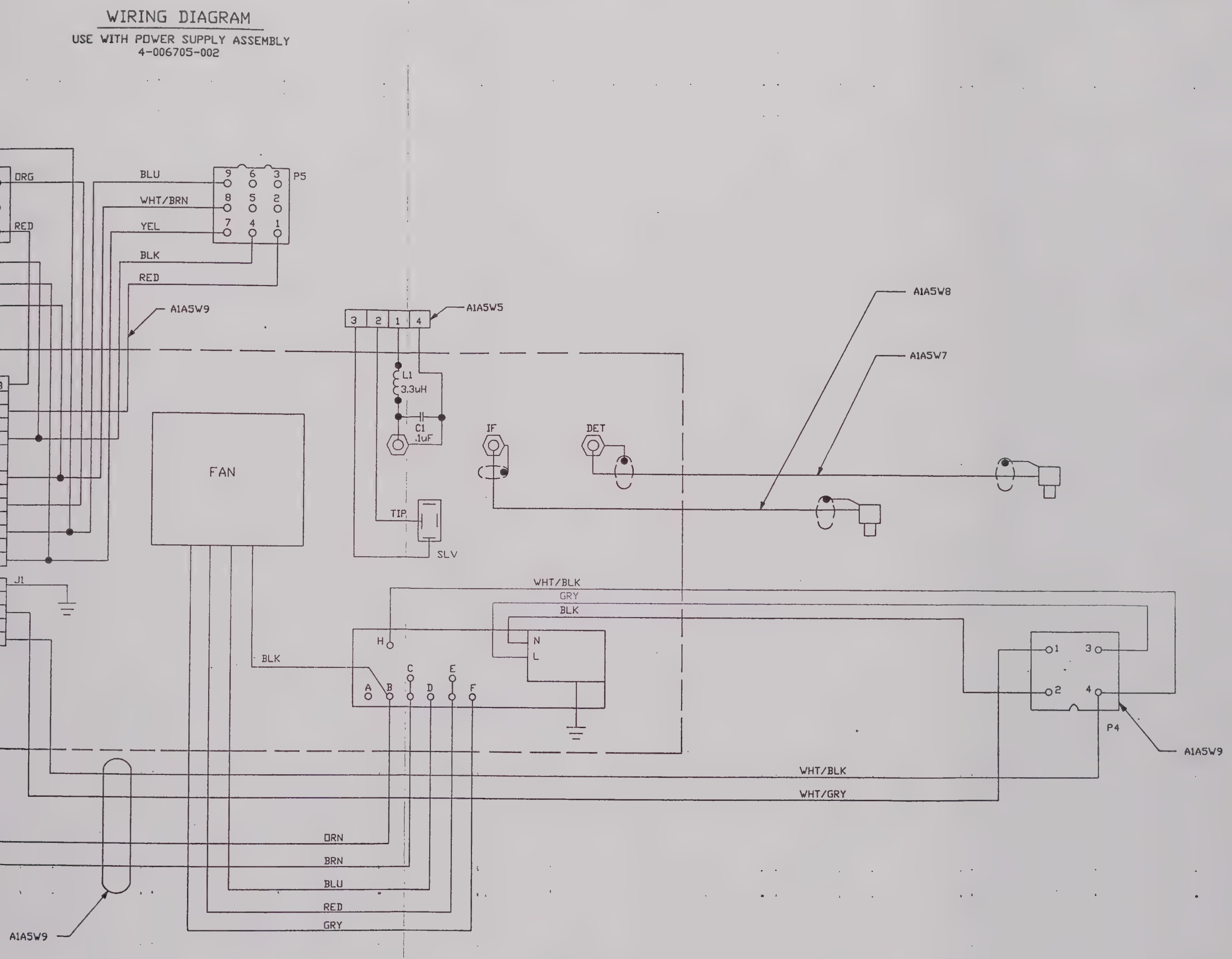
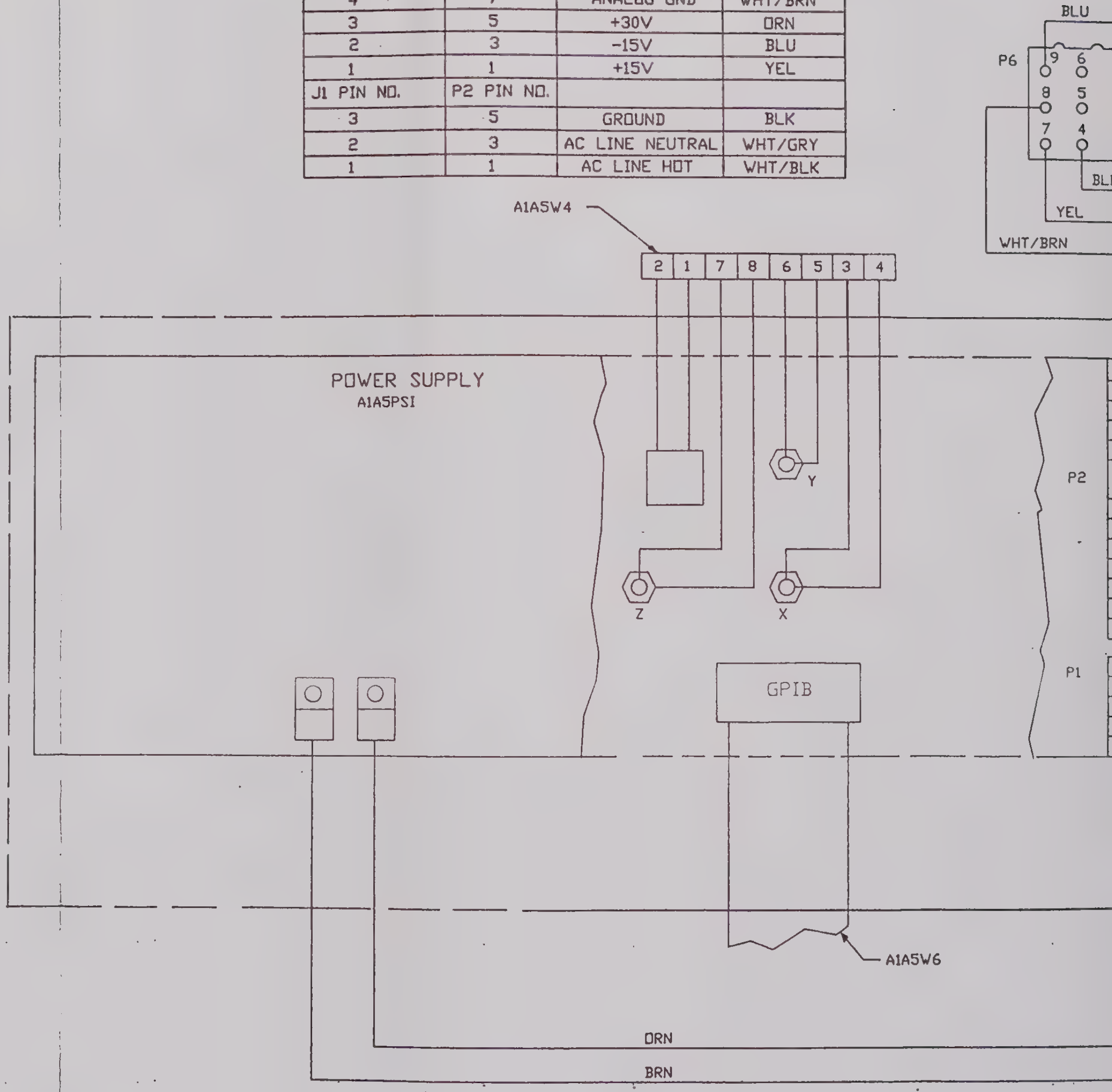
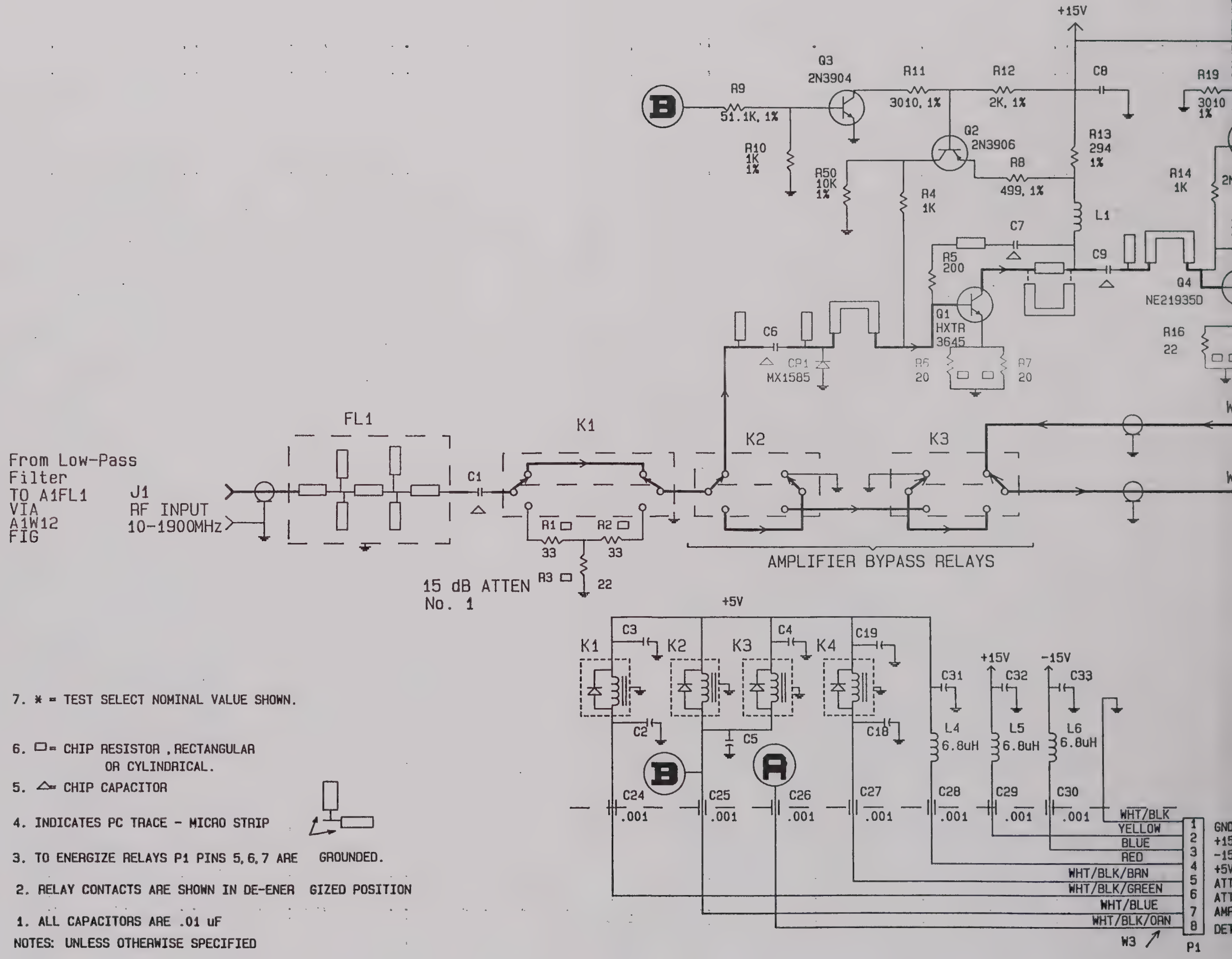

WIRING DIAGRAM
USE WITH POWER SUPPLY ASSEMBLY
4-006705-002
ORG
RED
BLU
WHT/BRN
YEL
BLK
RED
9
6
3
8
5
2
7
4
1
P5
A1A5W9
3
2
1
4
A1A5W5
L1
3.3uH
C1
.1uF
IF
DET
TIP
SLV
A1A5W8
A1A5W7
FAN
J1
WHT/BLK
GRY
BLK
H
N
L
BLK
A
B
C
D
E
F
1
3
2
4
P4
A1A5W9
WHT/BLK
WHT/GRY
ORN
BRN
BLU
RED
GRY
A1A5W9

Figure 7-10. REAR PANEL ASSEMBLY–(WITH SUMMIT SUPPLY)

A1A5A1 POWER SUPPLY	A1A5W9		
J2 PIN NO.	P2 PIN NO.	FUNCTION	WIRE COLOR
7	13	+5V	RED
6	11	+5V	RED
5	9	DIGITAL GND	BLK
4	7	ANALOG GND	WHT/BRN
3	5	+30V	ORN
2	3	-15V	BLU
1	1	+15V	YEL
J1 PIN NO.	P2 PIN NO.		
3	5	GROUND	BLK
2	3	AC LINE NEUTRAL	WHT/GRY
1	1	AC LINE HOT	WHT/BLK


A1A5W4
2
1
7
8
6
5
3
4
BLU
P6
9
6
8
5
7
4
BL
YEL
WHT/BRN
POWER SUPPLY
A1A5PSI
Y
Z
X
P2
P1
GPIB
A1A5W6
ORN
BRN


From Low-Pass
Filter
TO A1FL1
VIA
A1W12
FIG
J1
RF INPUT
10-1900MHz
FL1
C1
K1
R1
R2
33
33
R3
22
15 dB ATTEN
No. 1
K2
K3
AMPLIFIER BYPASS RELAYS
C6
CR1
MX1585
B
R9
51.1K, 1%
R10
1K
1%
Q3
2N3904
R50
10K
1%
R11
3010, 1%
R4
1K
Q2
2N3906
R12
2K, 1%
R8
499, 1%
+15V
C8
R13
294
1%
L1
C7
R5
200
Q1
HXTR
3645
R6
20
R7
20
C9
Q4
NE219350
R19
3010
1%
R14
1K
R16
22
+5V
K1
C3
K2
K3
C4
K4
C19
C2
C5
C18
B
A
C24
.001
C25
.001
C26
.001
C27
.001
C28
.001
C29
.001
C30
.001
C31
+15V
C32
-15V
C33
L4
6.8uH
L5
6.8uH
L6
6.8uH
WHT/BLK
YELLOW
BLUE
RED
WHT/BLK/BRN
WHT/BLK/GREEN
WHT/BLUE
WHT/BLK/ORN
W3
1
2
3
4
5
6
7
8
P1
GND
+15
-15
+5V
ATT
ATT
AMP
DET

7. * = TEST SELECT NOMINAL VALUE SHOWN.

6. ▭= CHIP RESISTOR ,RECTANGULAR
OR CYLINDRICAL.

5. △= CHIP CAPACITOR

4. INDICATES PC TRACE - MICRO STRIP

3. TO ENERGIZE RELAYS P1 PINS 5,6,7 ARE GROUNDED.

2. RELAY CONTACTS ARE SHOWN IN DE-ENERGIZED POSITION

1. ALL CAPACITORS ARE .01 uF

NOTES: UNLESS OTHERWISE SPECIFIED

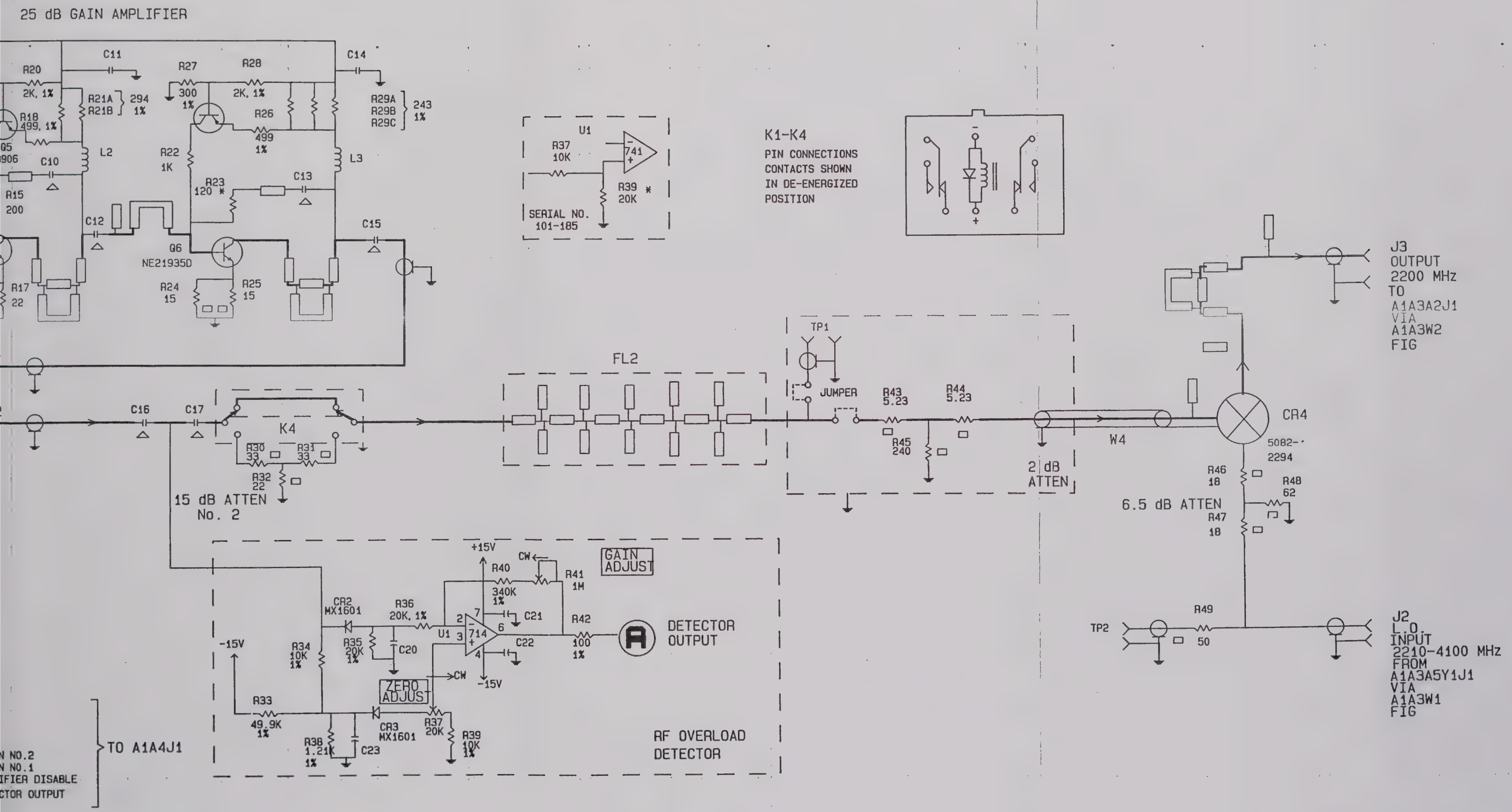
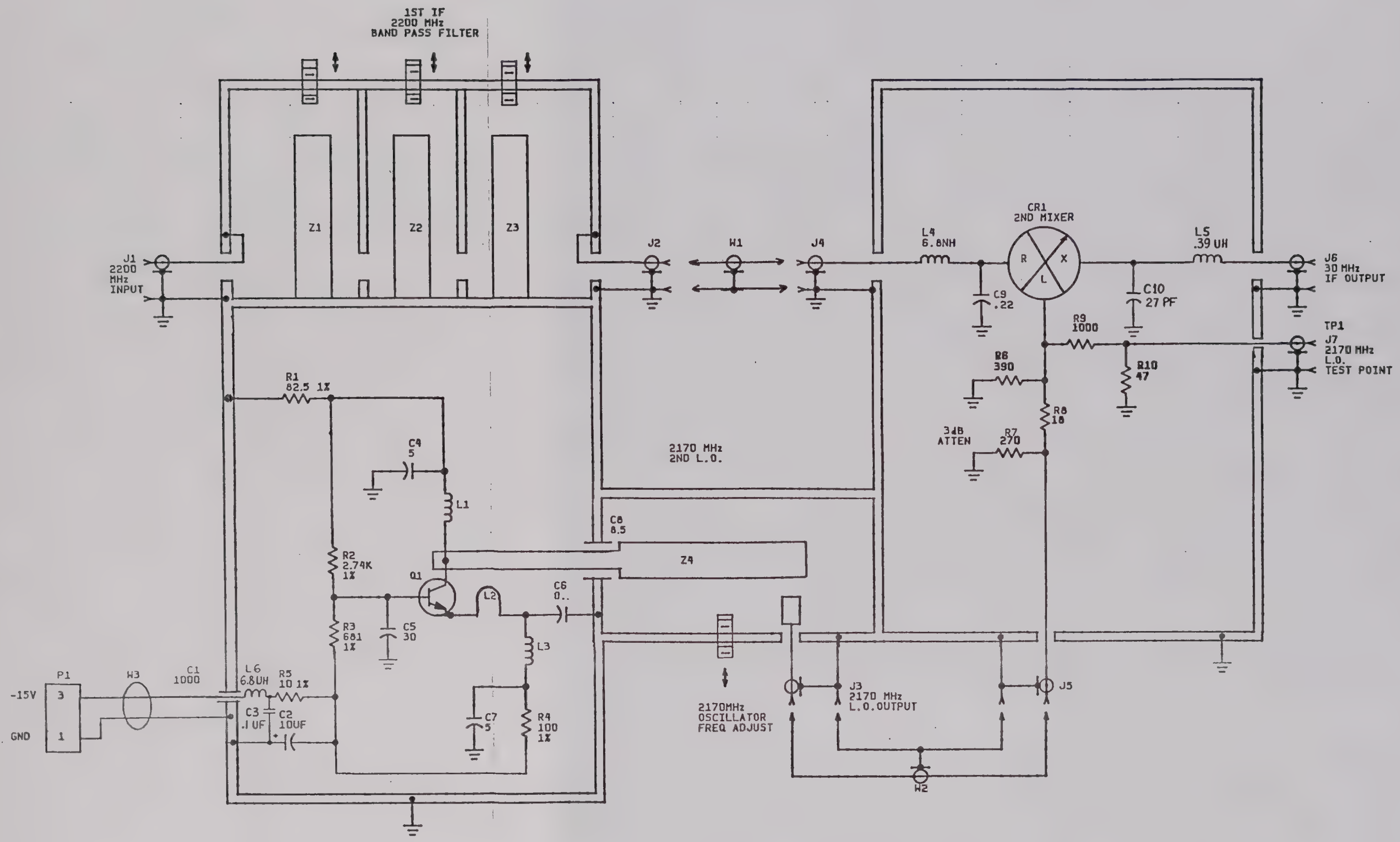

25 dB GAIN AMPLIFIER
R20
2K, 1%
R18
499, 1%
Q5
906
C10
R15
200
R17
22
C11
R21A
R21B
294
1%
L2
C12
R27
300
1%
R28
2K, 1%
R26
499
1%
R22
1K
R23
120 *
C13
Q6
NE21935D
R24
15
R25
15
L3
C14
R29A
R29B
R29C
243
1%
C15
U1
R37
10K
741
R39
20K
*
SERIAL NO.
101-185
K1-K4
PIN CONNECTIONS
CONTACTS SHOWN
IN DE-ENERGIZED
POSITION
C16
C17
K4
R30
33
R31
33
R32
22
15 dB ATTEN
No. 2
FL2
TP1
JUMPER
R43
5.23
R44
5.23
R45
240
2 dB
ATTEN
W4
CR4
5082-
2294
R46
18
R48
62
6.5 dB ATTEN
R47
18
J3
OUTPUT
2200 MHz
TO
A1A3A2J1
VIA
A1A3W2
FIG
TP2
R49
50
J2
L.O.
INPUT
2210-4100 MHz
FROM
A1A3A5Y1J1
VIA
A1A3W1
FIG
+15V
R40
340K
1%
CW
R41
1M
GAIN
ADJUST
CR2
MX1601
R36
20K, 1%
C21
R42
100
1%
DETECTOR
OUTPUT
-15V
R34
10K
1%
R35
20K
1%
C20
U1
714
C22
-15V
ZERO
ADJUST
CW
R33
49.9K
1%
R38
1.21K
1%
C23
CR3
MX1601
R37
20K
R39
10K
1%
RF OVERLOAD
DETECTOR
N NO.2
N NO.1
IFIER DISABLE
CTOR OUTPUT
TO A1A4J1

Figure 7-11. RF AMPLIFIER ASSEMBLY SCHEMATIC A1A3A1

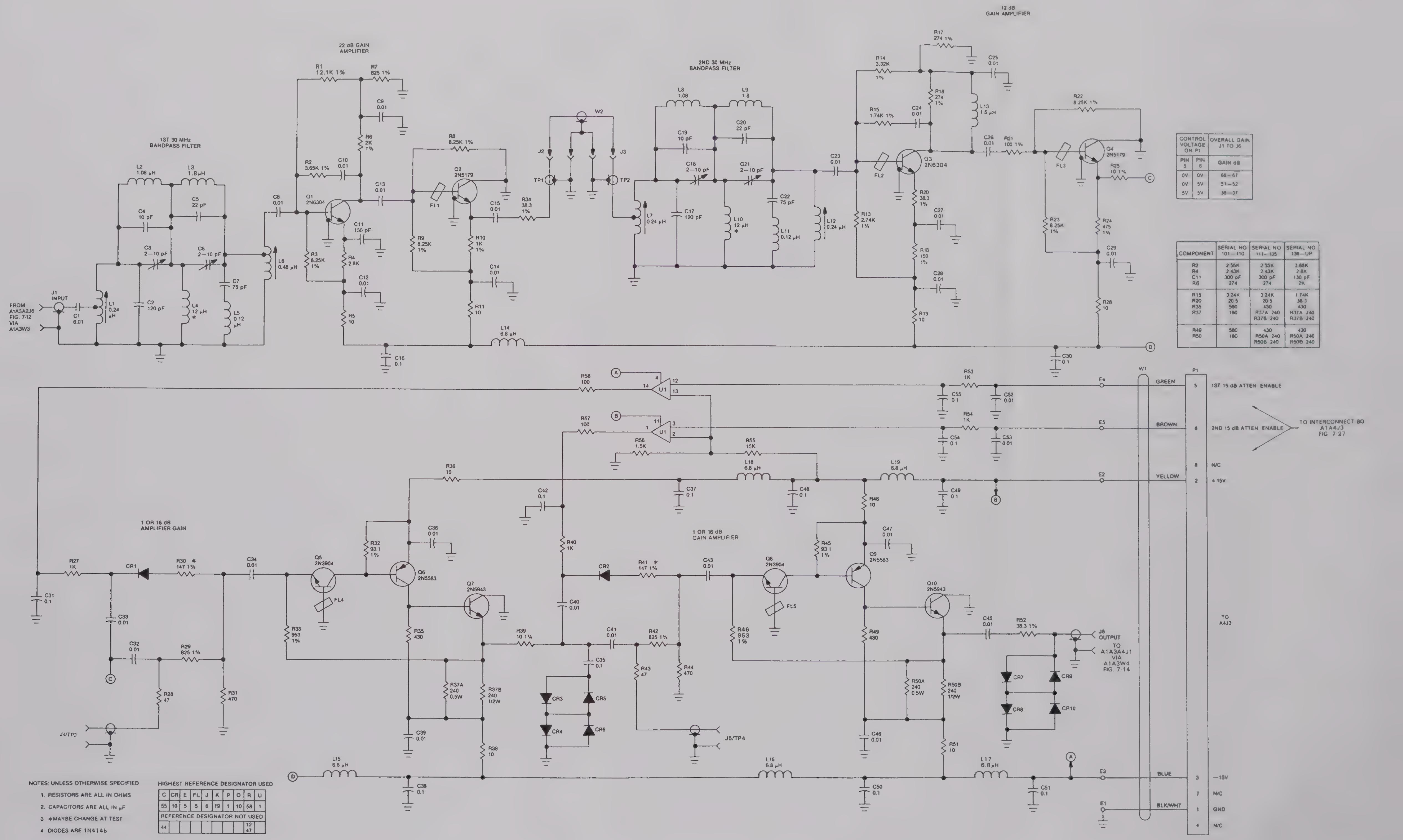

1ST IF
2200 MHz
BAND PASS FILTER
Z1
Z2
Z3
J1
2200
MHz
INPUT
J2
W1
J4
L4
6.8NH
CR1
2ND MIXER
R
X
L
L5
.39 UH
J6
30 MHz
IF OUTPUT
C9
.22
C10
27 PF
R9
1000
TP1
J7
2170 MHz
L.O.
TEST POINT
R6
390
R10
47
R8
18
3dB
ATTEN
R7
270
2170 MHz
2ND L.O.
R1
82.5 1%
C4
5
L1
C8
8.5
Z4
R2
2.74K
1%
Q1
L2
C6
0..
R3
681
1%
C5
30
L3
P1
-15V
3
GND
1
W3
C1
1000
L6
6.8UH
R5
10 1%
C3
.1 UF
C2
10UF
C7
5
R4
100
1%
2170MHz
OSCILLATOR
FREQ ADJUST
J3
2170 MHz
L.O.OUTPUT
J5
W2

HIGHEST REFERENCE DESIGNATOR USED									
C	CR	J	L	P	Q	TP	W	Z	R
10	1	7	6	1	1	1	3	4	10
NOT USED									

5. CAPACITORS ARE IN PF.
4. RESISTORS ARE IN OHMS.
3. CR1 IS HP 5082-2277.
2. Q1 IS HP HXTR-4101

NOTE: 1. C4,C5,C6,C7,C9,L4 ARE P.C. TRACE

Figure 7-12. SECOND CONVERTER SCHEMATIC A1A3A2


1ST 30 MHz BANDPASS FILTER
22 dB GAIN AMPLIFIER
2ND 30 MHz BANDPASS FILTER
12 dB GAIN AMPLIFIER
1 OR 16 dB AMPLIFIER GAIN
1 OR 16 dB GAIN AMPLIFIER
FROM A1A3A2J6 FIG. 7-12 VIA A1A3W3
J1 INPUT
C1 0.01
L1 0.24 µH
L2 1.08 µH
L3 1.8 µH
C4 10 pF
C5 22 pF
C3 2—10 pF
C6 2—10 pF
C2 120 pF
L4 12 µH *
C7 75 pF
L5 0.12 µH
L6 0.48 µH
C8 0.01
R1 12.1K 1%
R7 825 1%
C9 0.01
R6 2K 1%
R2 3.65K 1%
C10 0.01
Q1 2N6304
C13 0.01
C11 130 pF
R3 8.25K 1%
R4 2.8K
C12 0.01
R5 10
C16 0.1
R8 8.25K 1%
Q2 2N5179
FL1
R9 8.25K 1%
R10 1K 1%
C14 0.01
R11 10
C15 0.01
R34 38.3 1%
L14 6.8 µH
J2
TP1
W2
J3
TP2
L7 0.24 µH
L8 1.08
L9 1.8
C19 10 pF
C20 22 pF
C18 2—10 pF
C21 2—10 pF
C17 120 pF
L10 12 µH *
C22 75 pF
L11 0.12 µH
L12 0.24 µH
C23 0.01
R14 3.32K 1%
R17 274 1%
C25 0.01
R18 274 1%
R15 1.74K 1%
C24 0.01
L13 1.5 µH
Q3 2N6304
FL2
R13 2.74K 1%
R20 38.3 1%
C27 0.01
R18 150 1%
C28 0.01
R19 10
C26 0.01
R21 100 1%
R22 8.25K 1%
FL3
Q4 2N5179
R25 10 1%
R23 8.25K 1%
R24 475 1%
C29 0.01
R28 10
C30 0.1
R58 100
U1
R57 100
R56 1.5K
R55 15K
R53 1K
C55 0.1
C52 0.01
R54 1K
C54 0.1
C53 0.01
E4
E5
E2
E3
E1
W1
GREEN
BROWN
YELLOW
BLUE
BLK/WHT
P1
1ST 15 dB ATTEN ENABLE
2ND 15 dB ATTEN ENABLE
TO INTERCONNECT BD A1A4J3 FIG 7-27
N/C
+ 15V
—15V
GND
TO A4J3
R36 10
C37 0.1
L18 6.8 µH
C48 0.1
L19 6.8 µH
C49 0.1
C42 0.1
R40 1K
C31 0.1
R27 1K
CR1
R30 * 147 1%
C34 0.01
C33 0.01
C32 0.01
R29 825 1%
R28 47
R31 470
J4/TP3
Q5 2N3904
FL4
R33 953 1%
R32 93.1 1%
Q6 2N5583
C36 0.01
Q7 2N5943
R35 430
R37A 240 0.5W
R37B 240 1/2W
C39 0.01
R38 10
L15 6.8 µH
C38 0.1
R39 10 1%
C40 0.01
CR2
R41 * 147 1%
C41 0.01
R42 825 1%
C35 0.1
CR3
CR4
CR5
CR6
R43 47
R44 470
J5/TP4
C43 0.01
Q8 2N3904
FL5
R46 953 1%
R45 93.1 1%
Q9 2N5583
R48 10
C47 0.01
Q10 2N5943
R49 430
R50A 240 0.5W
R50B 240 1/2W
C46 0.01
R51 10
L16 6.8 µH
C50 0.1
L17 6.8 µH
C51 0.1
C45 0.01
R52 38.3 1%
CR7
CR8
CR9
CR10
J6 OUTPUT
TO A1A3A4J1 VIA A1A3W4 FIG. 7-14
A
B
C
D

CONTROL VOLTAGE ON P1		OVERALL GAIN J1 TO J6
PIN 5	PIN 6	GAIN dB
0V	0V	66—67
0V	5V	51—52
5V	5V	36—37

COMPONENT	SERIAL NO 101—110	SERIAL NO 111—135	SERIAL NO 136—UP
R2 R4 C11 R6	2.55K 2.43K 300 pF 274	2.55K 2.43K 300 pF 274	3.65K 2.8K 130 pF 2K
R15 R20 R35 R37	3.24K 20.5 560 180	3.24K 20.5 430 R37A 240 R37B 240	1.74K 38.3 430 R37A 240 R37B 240
R49 R50	560 180	430 R50A 240 R50B 240	430 R50A 240 R50B 240

NOTES: UNLESS OTHERWISE SPECIFIED

1. RESISTORS ARE ALL IN OHMS
2. CAPACITORS ARE ALL IN µF
3. *MAYBE CHANGE AT TEST
4. DIODES ARE 1N4146

HIGHEST REFERENCE DESIGNATOR USED

C	CR	E	FL	J	K	P	Q	R	U
55	10	5	5	6	19	1	10	58	1
REFERENCE DESIGNATOR NOT USED									
44								12 47	

Figure 7-13. FIRST 30 MHz IF PREAMPLIFIER SCHEMATIC A1A3A3

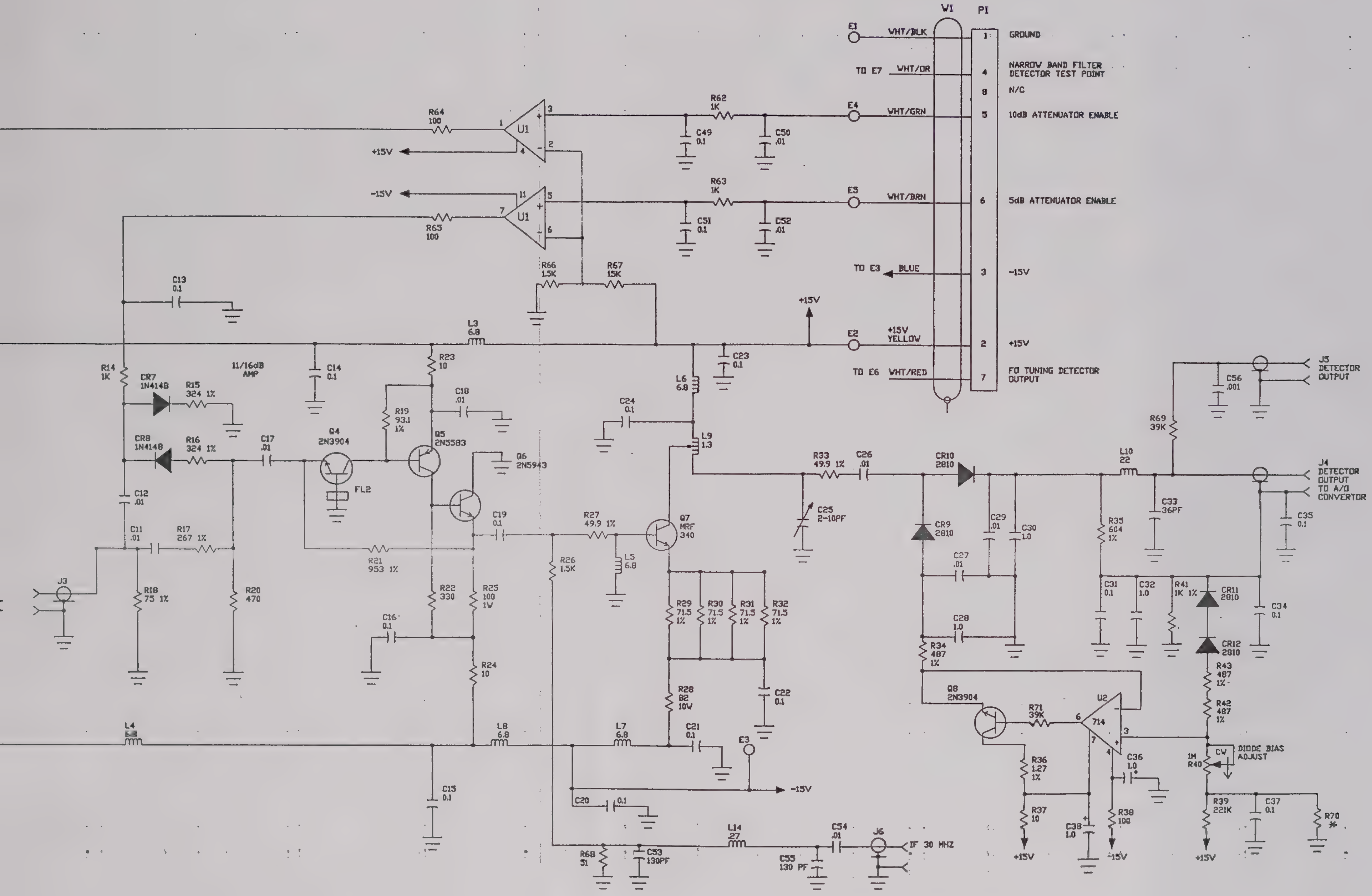
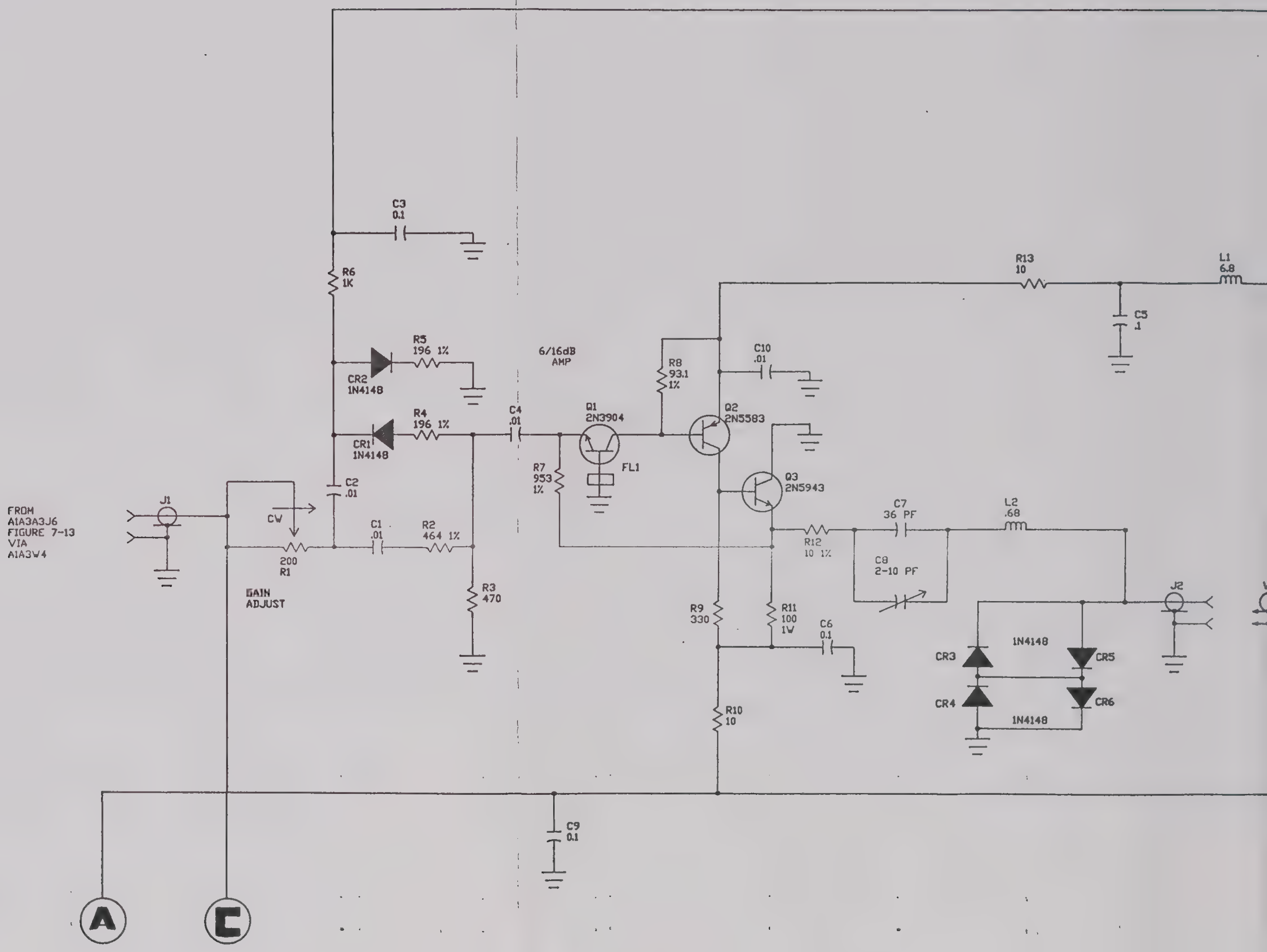
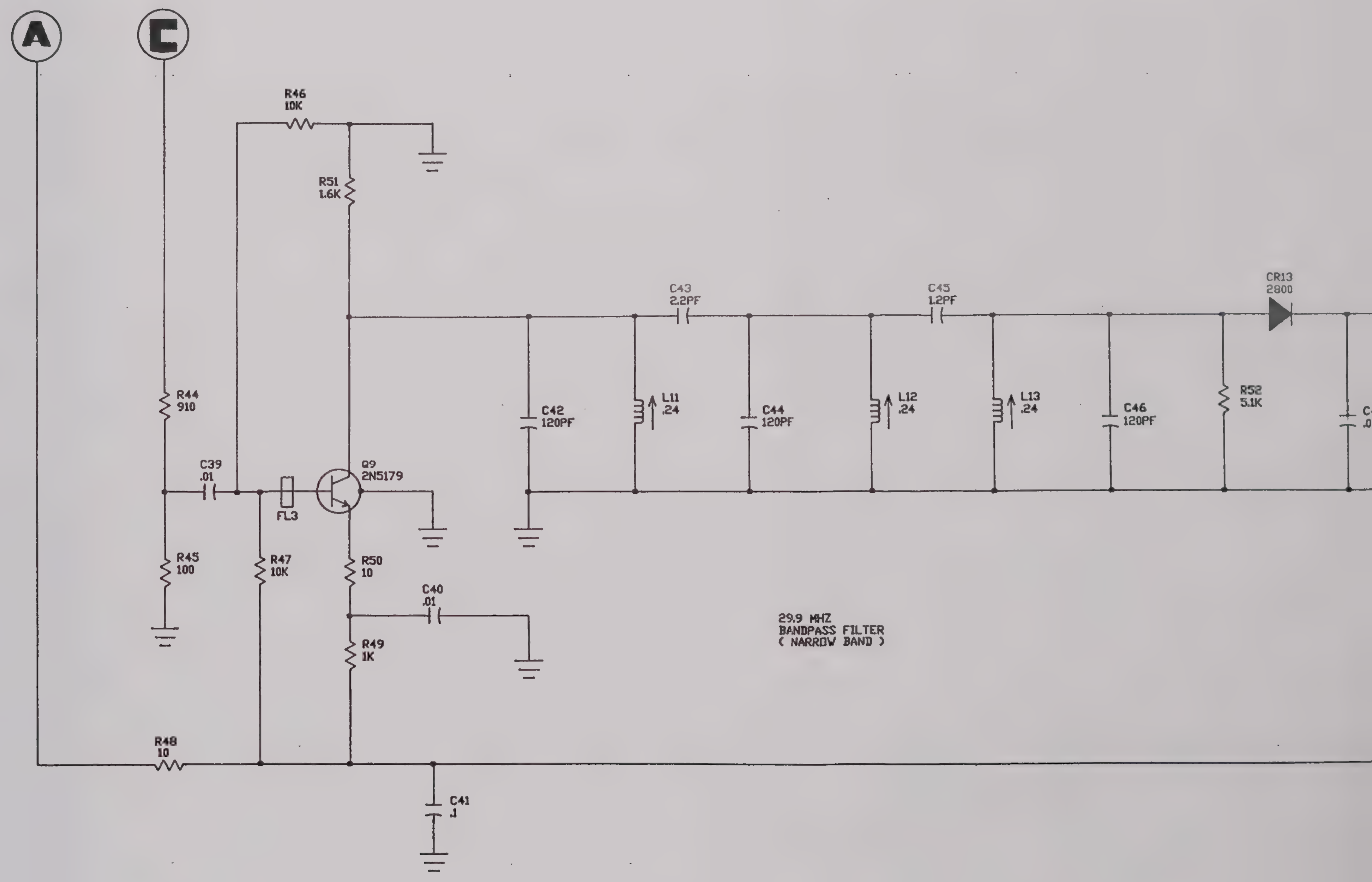

W1
P1
E1 WHT/BLK 1 GROUND
TO E7 WHT/OR 4 NARROW BAND FILTER DETECTOR TEST POINT
8 N/C
E4 WHT/GRN 5 10dB ATTENUATOR ENABLE
E5 WHT/BRN 6 5dB ATTENUATOR ENABLE
TO E3 BLUE 3 -15V
E2 +15V YELLOW 2 +15V
TO E6 WHT/RED 7 FD TUNING DETECTOR OUTPUT
R64 100
R65 100
U1
+15V
-15V
R62 1K
R63 1K
C49 0.1
C50 .01
C51 0.1
C52 .01
R66 1.5K
R67 15K
C13 0.1
L3 6.8
C23 0.1
R14 1K
CR7 1N4148
R15 324 1%
CR8 1N4148
R16 324 1%
11/16dB AMP
C14 0.1
R23 10
C18 .01
R19 93.1 1%
Q4 2N3904
Q5 2N5583
Q6 2N5943
FL2
C17 .01
C12 .01
C11 .01
R17 267 1%
R18 75 1%
R20 470
R21 953 1%
J3
C19 0.1
R22 330
R25 100 1W
C16 0.1
R24 10
L4 6.8
L8 6.8
C15 0.1
L6 6.8
C24 0.1
L9 1.3
R27 49.9 1%
Q7 MRF 340
L5 6.8
R26 1.5K
R29 71.5 1%
R30 71.5 1%
R31 71.5 1%
R32 71.5 1%
R28 82 10W
C22 0.1
L7 6.8
C21 0.1
E3
-15V
C20 0.1
R68 51
C53 130PF
L14 27
C54 .01
C55 130 PF
J6
IF 30 MHZ
R33 49.9 1%
C26 .01
C25 2-10PF
CR10 2810
CR9 2810
C29 .01
C30 1.0
C27 .01
C28 1.0
R34 487 1%
Q8 2N3904
R71 39K
U2 714
R36 1.27 1%
R37 10
C38 1.0
R38 100
C36 1.0
+15V
-15V
L10 22
R69 39K
C56 .001
J5 DETECTOR OUTPUT
J4 DETECTOR OUTPUT TO A/D CONVERTOR
C33 36PF
C35 0.1
R35 604 1%
C31 0.1
C32 1.0
R41 1K 1%
CR11 2810
CR12 2810
C34 0.1
R43 487 1%
R42 487 1%
1M R40
CW
DIODE BIAS ADJUST
R39 221K
C37 0.1
R70 *

Figure 7-14(a). SECOND 30 MHz IF DETECTOR SCHEMATIC A1A3A4


FROM
A1A3A3J6
FIGURE 7-13
VIA
A1A3W4
J1
CW
200
R1
GAIN
ADJUST
C2
.01
C1
.01
R2
464 1%
R3
470
R6
1K
C3
0.1
CR2
1N4148
R5
196 1%
CR1
1N4148
R4
196 1%
C4
.01
6/16dB
AMP
Q1
2N3904
FL1
R7
953
1%
R8
93.1
1%
C10
.01
Q2
2N5583
Q3
2N5943
R12
10 1%
C7
36 PF
C8
2-10 PF
L2
.68
R9
330
R11
100
1W
C6
0.1
R10
10
CR3
CR4
1N4148
CR5
CR6
1N4148
J2
R13
10
C5
.1
L1
6.8
C9
0.1
A
C


A
C
R46
10K
R51
1.6K
C43
2.2PF
C45
1.2PF
CR13
2800
R44
910
C39
.01
FL3
Q9
2N5179
C42
120PF
L11
.24
C44
120PF
L12
.24
L13
.24
C46
120PF
R52
5.1K
R45
100
R47
10K
R50
10
C40
.01
R49
1K
29.9 MHZ
BANDPASS FILTER
(NARROW BAND)
R48
10
C41
.1

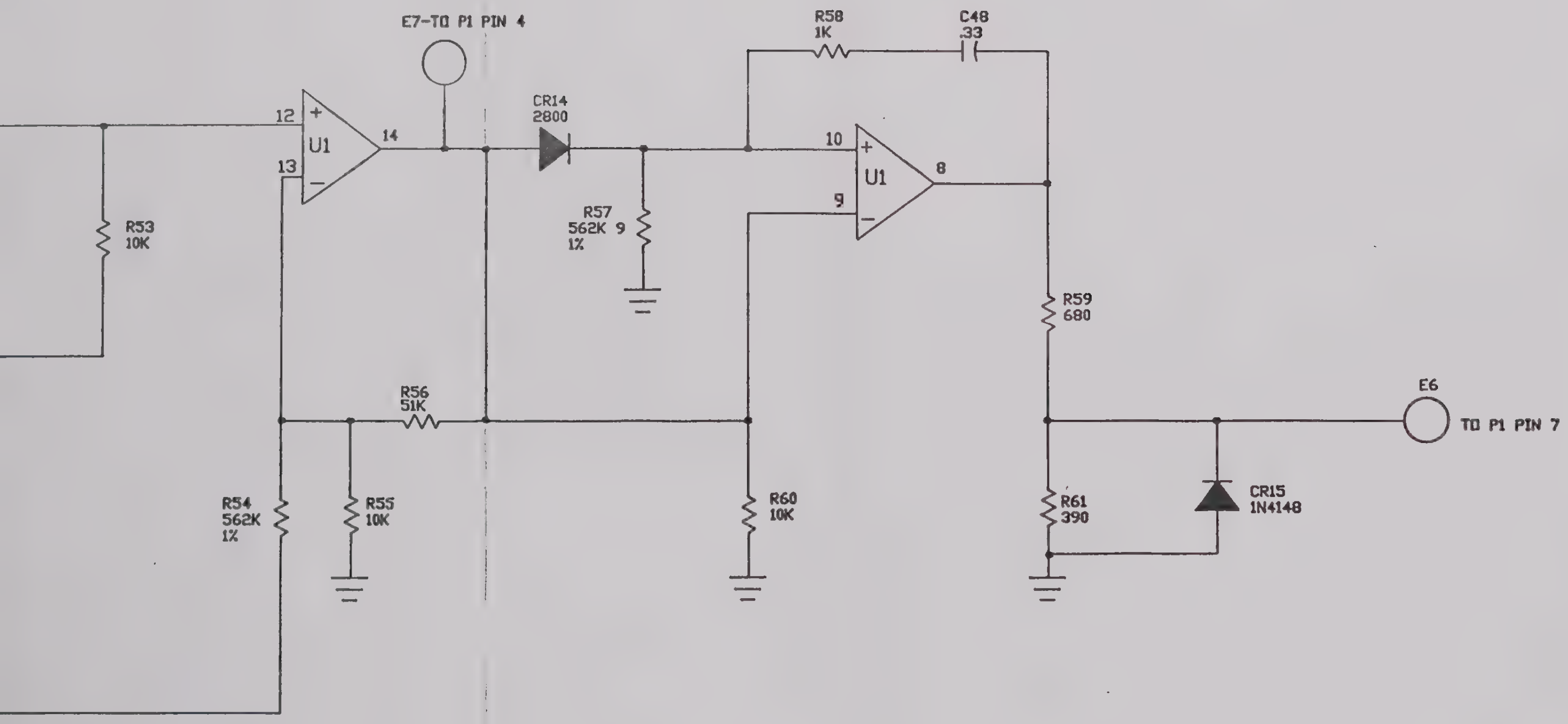

E7-TO P1 PIN 4
12
13
U1
14
CR14
2800
R57
562K 9
1%
R58
1K
C48
.33
10
9
U1
8
R53
10K
R59
680
R56
51K
E6
TO P1 PIN 7
R54
562K
1%
R55
10K
R60
10K
R61
390
CR15
1N4148

Figure 7-14(b). SECOND 30 MHz IF DETECTOR SCHEMATIC A1A3A4

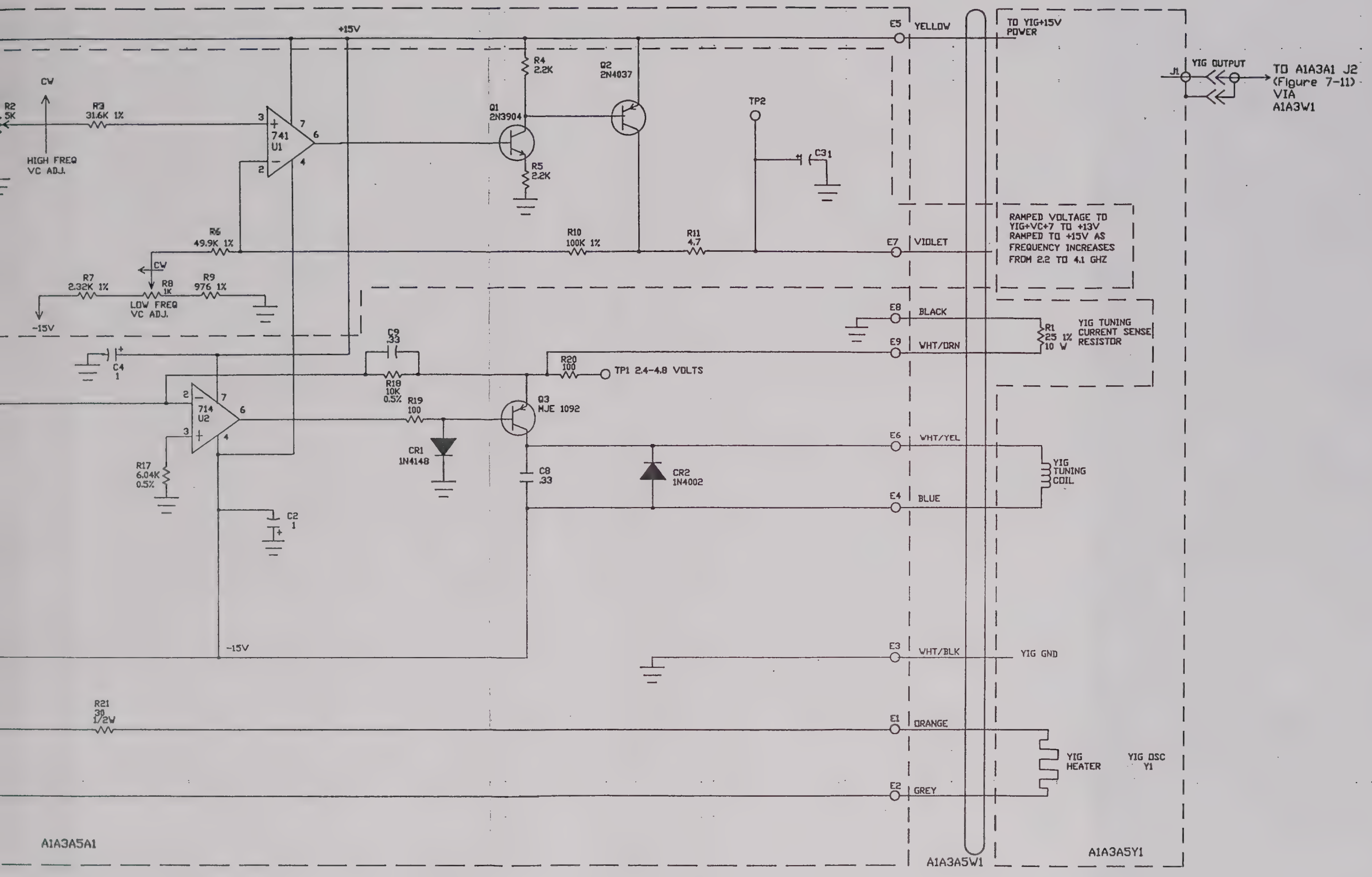
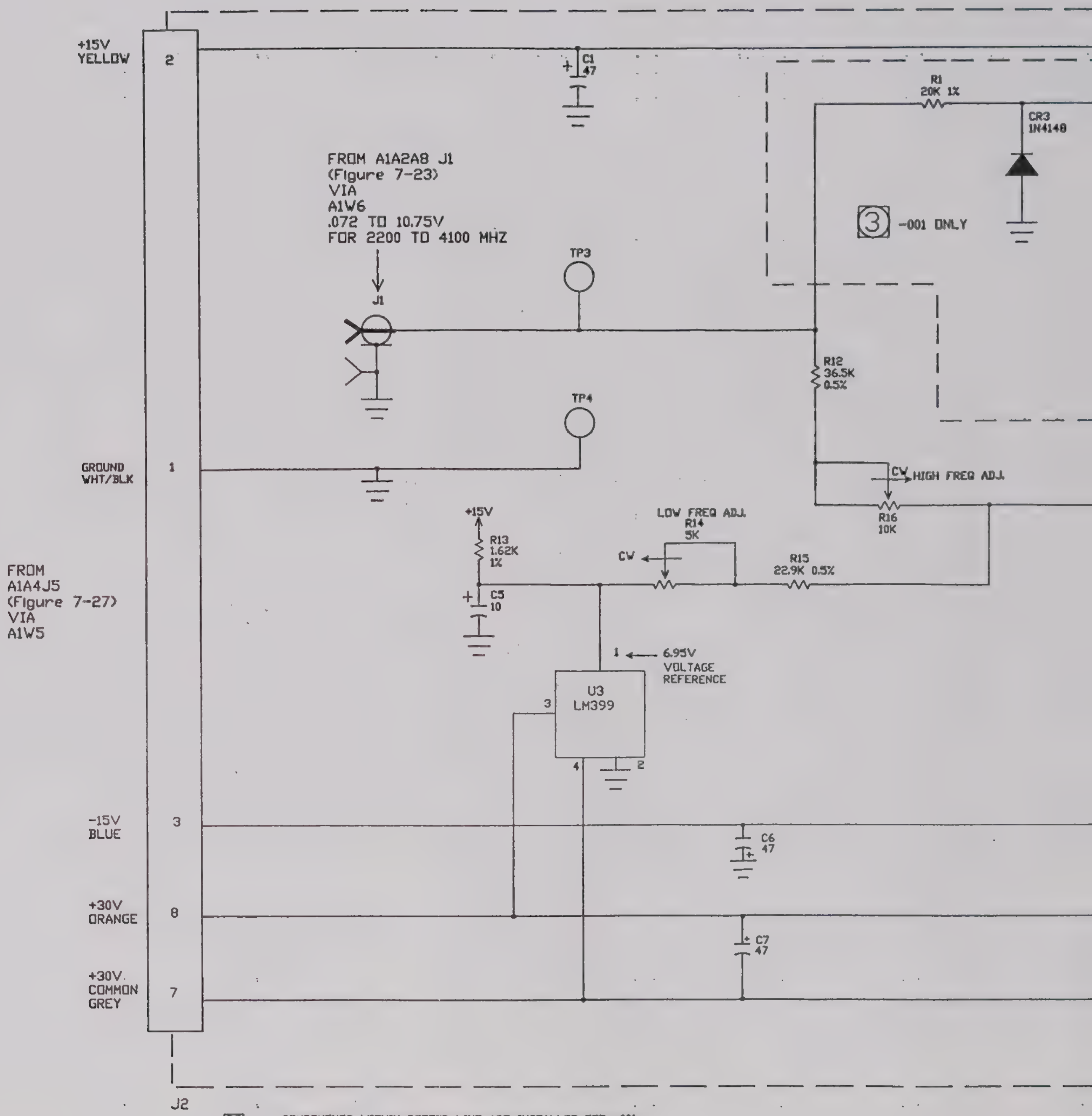

E5
YELLOW
TO YIG+15V POWER
+15V
J1
YIG OUTPUT
TO A1A3A1 J2 (Figure 7-11) VIA A1A3W1
R4 2.2K
Q2 2N4037
Q1 2N3904
R5 2.2K
TP2
C31
CW
R2 .5K
R3 31.6K 1%
HIGH FREQ VC ADJ.
3
741 U1
7
6
2
4
R6 49.9K 1%
R10 100K 1%
R11 4.7
E7
VIOLET
RAMPED VOLTAGE TO YIG+VC+7 TO +13V RAMPED TO +15V AS FREQUENCY INCREASES FROM 2.2 TO 4.1 GHZ
CW
R7 2.32K 1%
R8 1K
LOW FREQ VC ADJ.
R9 976 1%
-15V
E8
BLACK
E9
WHT/ORN
R1 25 1% 10 W
YIG TUNING CURRENT SENSE RESISTOR
C9 .33
C4 1
R18 10K 0.5%
R20 100
TP1 2.4-4.8 VOLTS
R19 100
Q3 MJE 1092
2
714 U2
7
6
3
4
R17 6.04K 0.5%
CR1 1N4148
C8 .33
CR2 1N4002
E6
WHT/YEL
YIG TUNING COIL
E4
BLUE
C2 1
-15V
E3
WHT/BLK
YIG GND
R21 30 1/2W
E1
ORANGE
YIG HEATER
YIG OSC Y1
E2
GREY
A1A3A5A1
A1A3A5W1
A1A3A5Y1

Figure 7-15. YIG LOCAL OSCILLATOR AND DRIVER SCHEMATIC A1A3A5


+15V
YELLOW
2
C1
47
R1
20K 1%
CR3
1N4148
FROM A1A2A8 J1
(Figure 7-23)
VIA
A1W6
.072 TO 10.75V
FOR 2200 TO 4100 MHZ
③ -001 ONLY
TP3
J1
R12
36.5K
0.5%
TP4
GROUND
WHT/BLK
1
CW
HIGH FREQ ADJ.
R16
10K
+15V
LOW FREQ ADJ.
R14
5K
R13
1.62K
1%
CW
R15
22.9K 0.5%
FROM
A1A4J5
(Figure 7-27)
VIA
A1W5
C5
10
1
6.95V
VOLTAGE
REFERENCE
U3
LM399
3
4
2
-15V
BLUE
3
C6
47
+30V
ORANGE
8
C7
47
+30V
COMMON
GREY
7
J2

③ COMPONENTS WITHIN DOTTED LINE ARE INSTALLED FOR -001 40 mW YIG ; ARE OMITTED FOR 002, 25 mW YIG

2. ALL CAPACITORS ARE IN UF.
TEXT

1. ALL RESISTORS ARE IN OHMS.

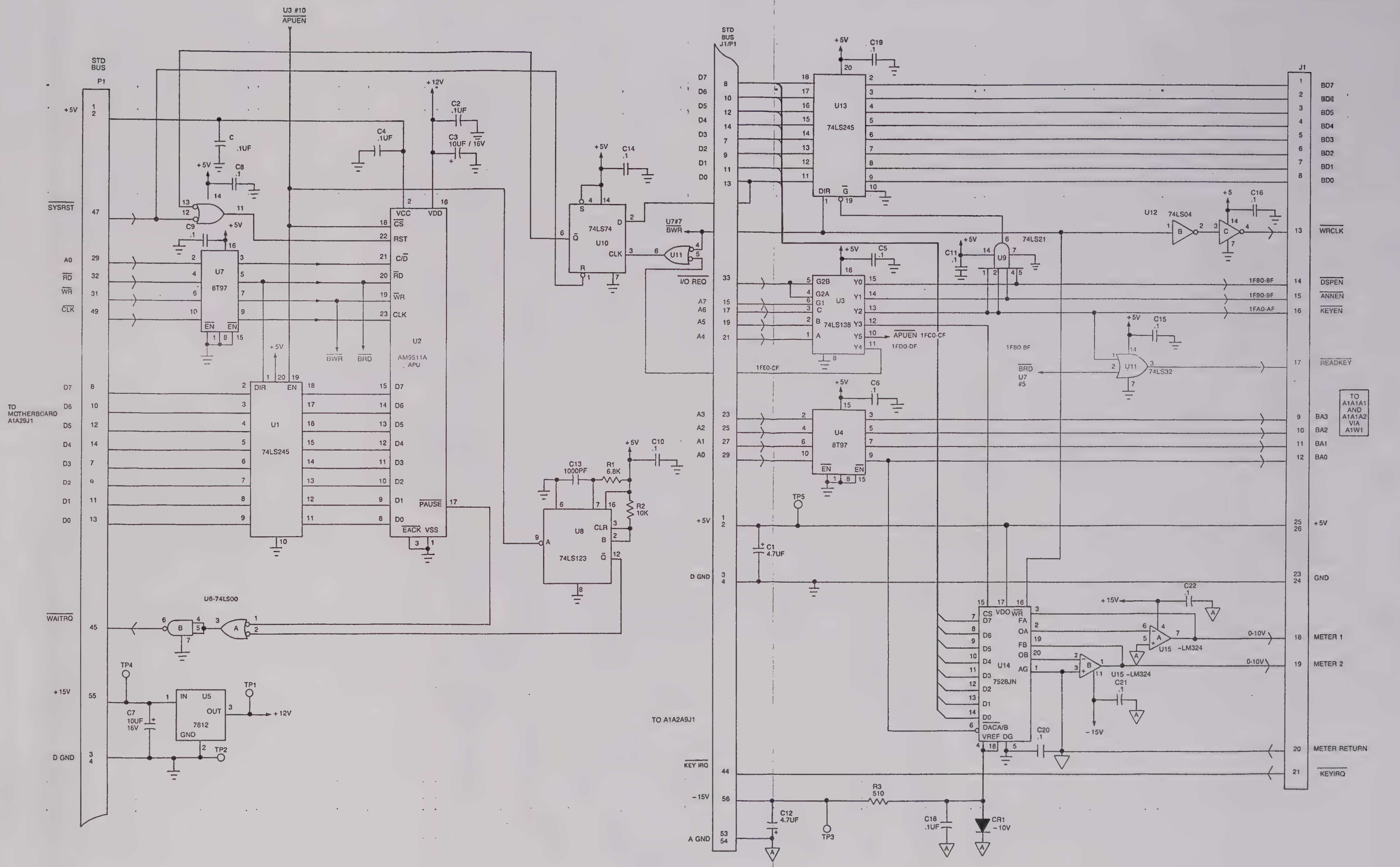

U3 #10
APUEN
STD BUS
P1
+5V
SYSRST
A0
RD
WR
CLK
TO MOTHERBOARD A1A29J1
D7
D6
D5
D4
D3
D2
D1
D0
WAITRQ
+15V
D GND
C
.1UF
C8
.1
C9
.1
+5V
U7
8T97
EN
BWR
BRD
U1
74LS245
DIR
C4
.1UF
C2
.1UF
C3
10UF / 16V
+12V
VCC
VDD
CS
RST
C/D
CLK
U2
AM9511A
APU
PAUSE
EACK
VSS
U6-74LS00
TP4
C7
10UF
16V
IN
U5
OUT
7812
GND
TP1
TP2
C14
.1
74LS74
U10
Q
CLK
U7#7
BWR
U11
I/O REQ
C13
1000PF
R1
6.8K
C10
.1
R2
10K
U8
74LS123
CLR
TO A1A2A9J1
STD BUS
J1/P1
A7
A6
A5
A4
A3
A2
A1
A0
+5V
D GND
KEY IRQ
−15V
A GND
C19
.1
U13
74LS245
C5
.1
C11
.1
U9
74LS21
G2B
G2A
G1
U3
74LS138
Y0
Y1
Y2
Y3
Y5
Y4
APUEN 1FC0-CF
1FD0-DF
1FE0-CF
1F80 BF
C6
.1
U4
8T97
TP5
C1
4.7UF
C12
4.7UF
TP3
R3
510
C18
.1UF
CR1
−10V
U12
74LS04
C16
.1
C15
.1
U11
74LS32
BRD
U7
#5
1F80-8F
1F90-9F
1FA0-AF
U14
7528JN
DACA/B
VREF
DG
FA
OA
FB
OB
AG
C20
.1
C22
.1
+15V
U15 -LM324
C21
.1
−15V
0-10V
J1
BD7
BD6
BD5
BD4
BD3
BD2
BD1
BD0
WRCLK
DSPEN
ANNEN
KEYEN
READKEY
BA3
BA2
BA1
BA0
TO A1A1A1 AND A1A1A2 VIA A1W1
+5V
GND
METER 1
METER 2
METER RETURN
KEYIRQ

Figure 7-16. FRONT PANEL I/O AND APU SCHEMATIC A1A2A1

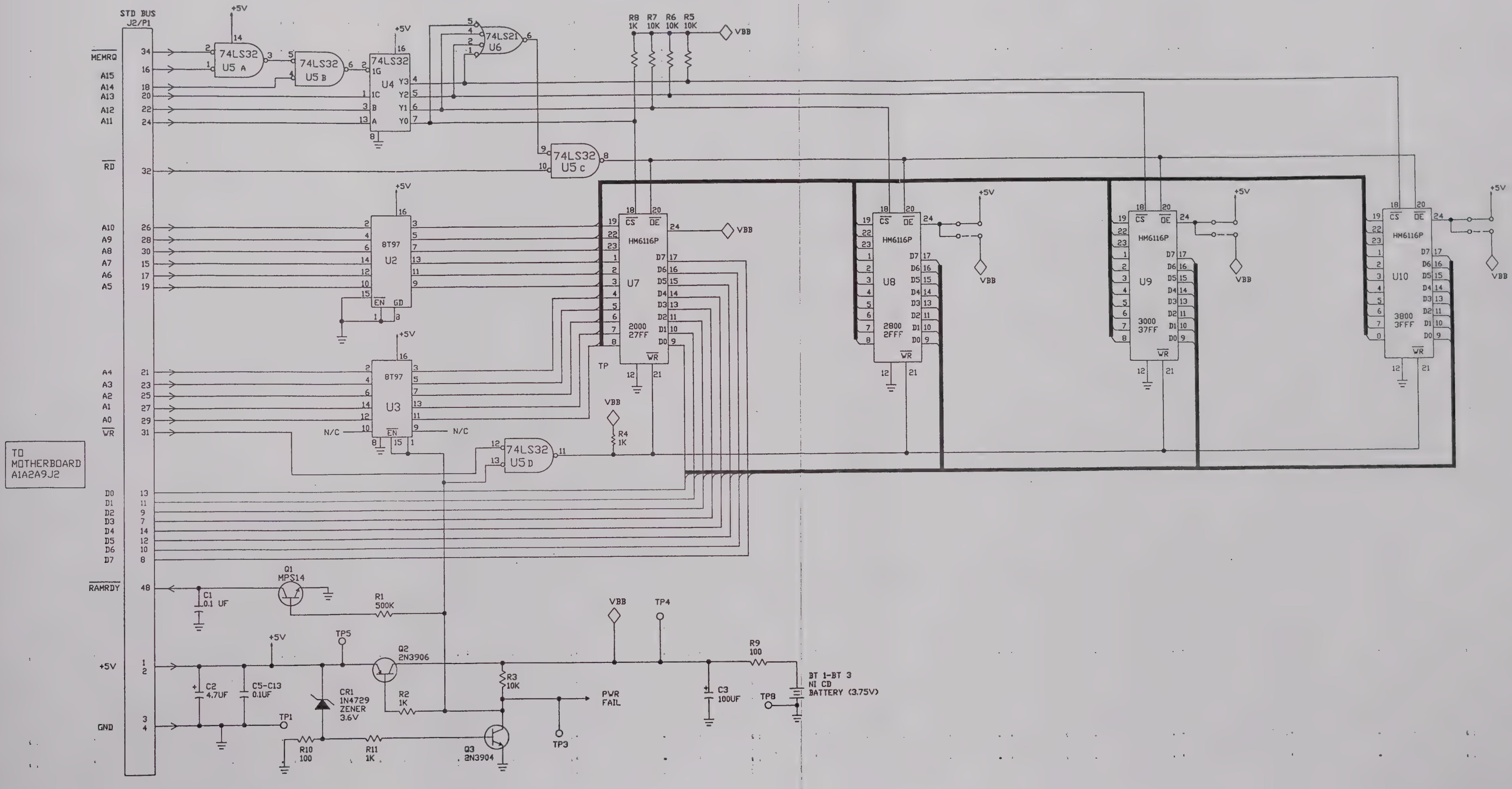
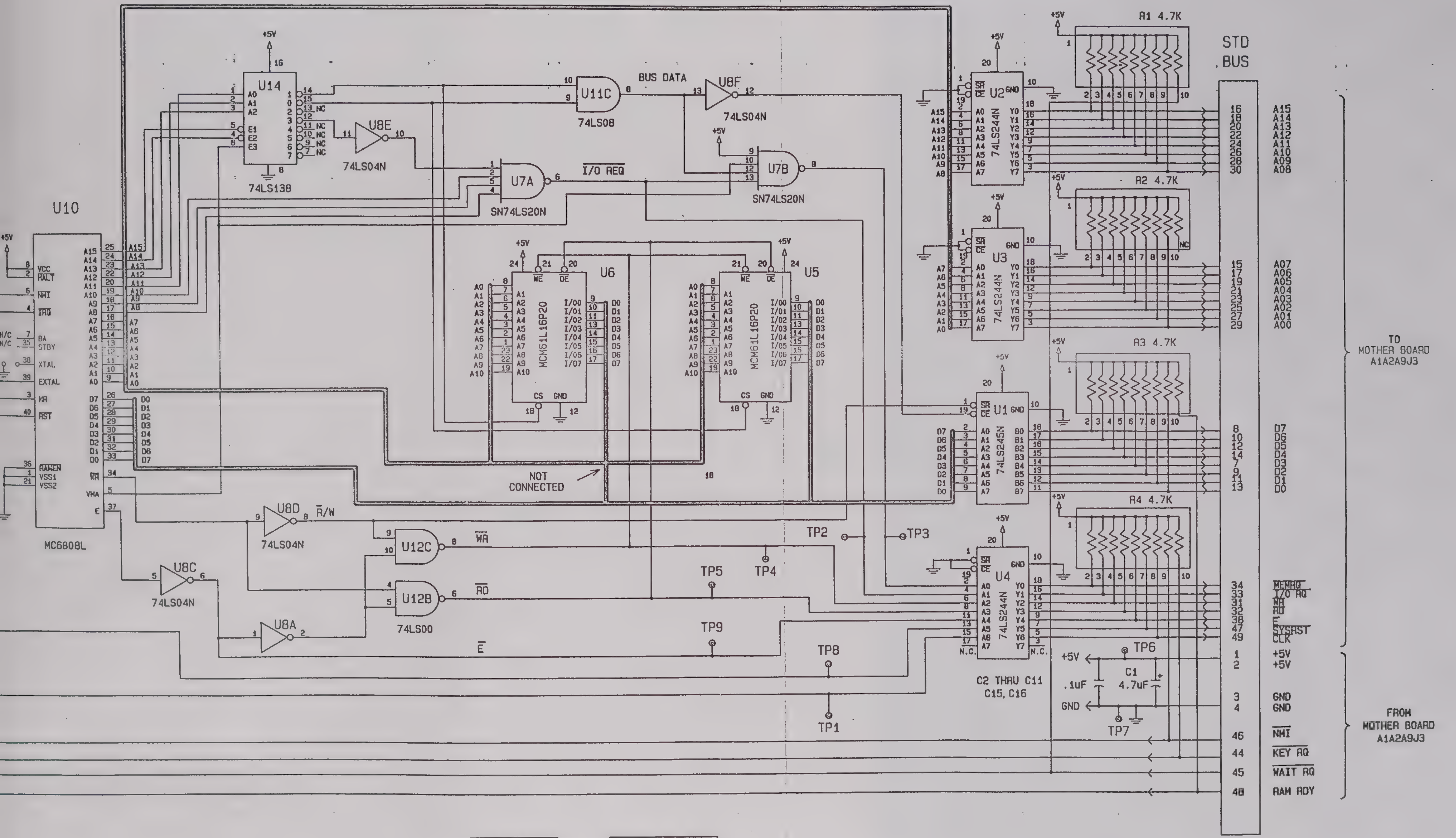

STD BUS
J2/P1
TO MOTHERBOARD A1A2A9J2
MEMRQ
A15
A14
A13
A12
A11
RD
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
WR
D0
D1
D2
D3
D4
D5
D6
D7
RAMRDY
+5V
GND
74LS32 U5 A
74LS32 U5 B
74LS32 U4
74LS21 U6
74LS32 U5 C
74LS32 U5 D
8T97 U2
8T97 U3
EN GD
N/C
R8 1K
R7 10K
R6 10K
R5 10K
VBB
HM6116P U7 2000 27FF
HM6116P U8 2800 2FFF
HM6116P U9 3000 37FF
HM6116P U10 3800 3FFF
CS OE WR
TP
R4 1K
Q1 MPS14
C1 0.1 UF
R1 500K
C2 4.7UF
C5-C13 0.1UF
TP1
TP5
CR1 1N4729 ZENER 3.6V
R10 100
R11 1K
Q2 2N3906
R2 1K
Q3 2N3904
R3 10K
PWR FAIL
TP3
TP4
C3 100UF
R9 100
TP8
BT 1-BT 3 NI CD BATTERY (3.75V)

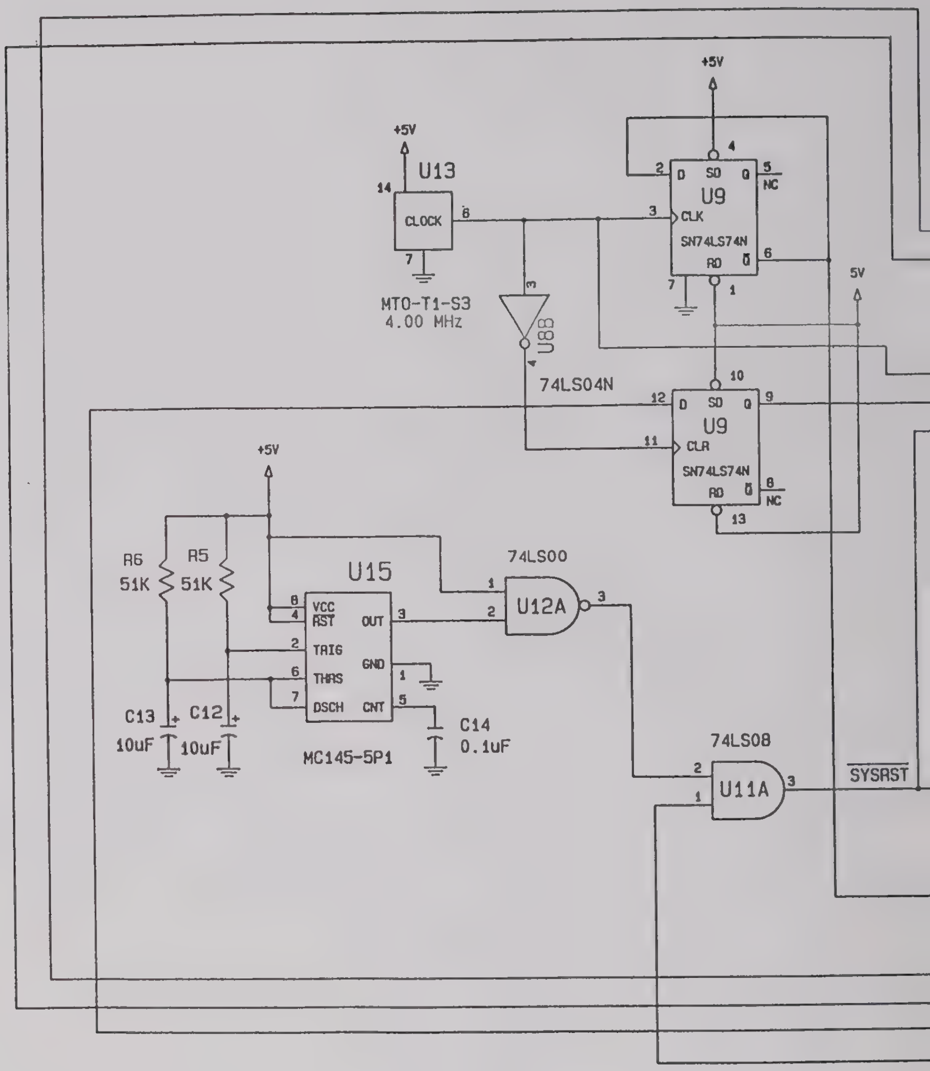
Figure 7-17. RAM AND BATTERY BACK UP RAM SCHEMATIC A1A2A2


U10
MC6808L
VCC
HALT
NMI
IRQ
BA
STBY
XTAL
EXTAL
MR
RST
RAMEN
VSS1
VSS2
N/C
+5V
R/W
VMA
E
U14
74LS138
U8E
74LS04N
U7A
SN74LS20N
I/O REQ
U11C
74LS08
BUS DATA
U8F
74LS04N
U7B
SN74LS20N
U6
MCM61L16P20
U5
MCM61L16P20
NOT CONNECTED
U8D
74LS04N
U8C
74LS04N
U12C
WR
U12B
RD
74LS00
U8A
E
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
U2
74LS244N
U3
74LS244N
U1
74LS245N
U4
74LS244N
R1 4.7K
R2 4.7K
R3 4.7K
R4 4.7K
C1 4.7uF
.1uF
C2 THRU C11
C15, C16
+5V
GND
STD BUS
P1
A15 A14 A13 A12 A11 A10 A09 A08
A07 A06 A05 A04 A03 A02 A01 A00
D7 D6 D5 D4 D3 D2 D1 D0
MEMRQ
I/O RQ
WR
RD
E
SYSRST
CLK
+5V
+5V
GND
GND
NMI
KEY RQ
WAIT RQ
RAM RDY
TO MOTHER BOARD A1A2A9J3
FROM MOTHER BOARD A1A2A9J3

IC	+5V	GND
U12	14	7
U11	14	7
U8	14	7
U7	14	7

HIGHEST REF DESIG									
C			P			R	TP	U	
16			1			6	9	15	
NOT USED									

Figure 7-18. MICROPROCESSOR SCHEMATIC A1A2A3


+5V
U13
CLOCK
MTO-T1-S3
4.00 MHz
U8B
74LS04N
+5V
U9
SN74LS74N
U9
SN74LS74N
D
SD
Q
CLK
CLR
RD
Q̄
NC
5V
+5V
R6
51K
R5
51K
U15
VCC
RST
TRIG
THRS
DSCH
OUT
GND
CNT
MC145-5P1
C13
10uF
C12
10uF
C14
0.1uF
74LS00
U12A
74LS08
U11A
SYSRST

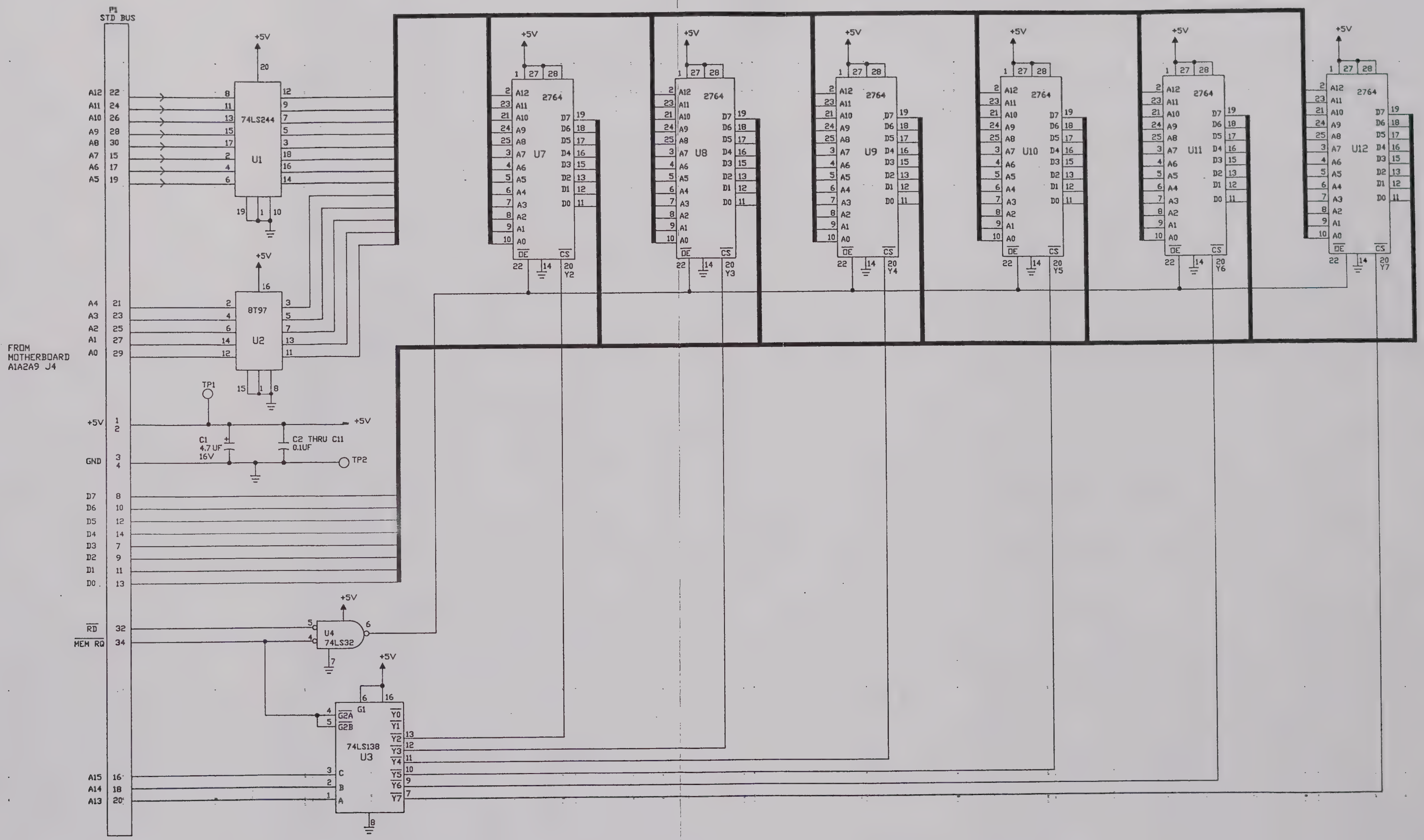
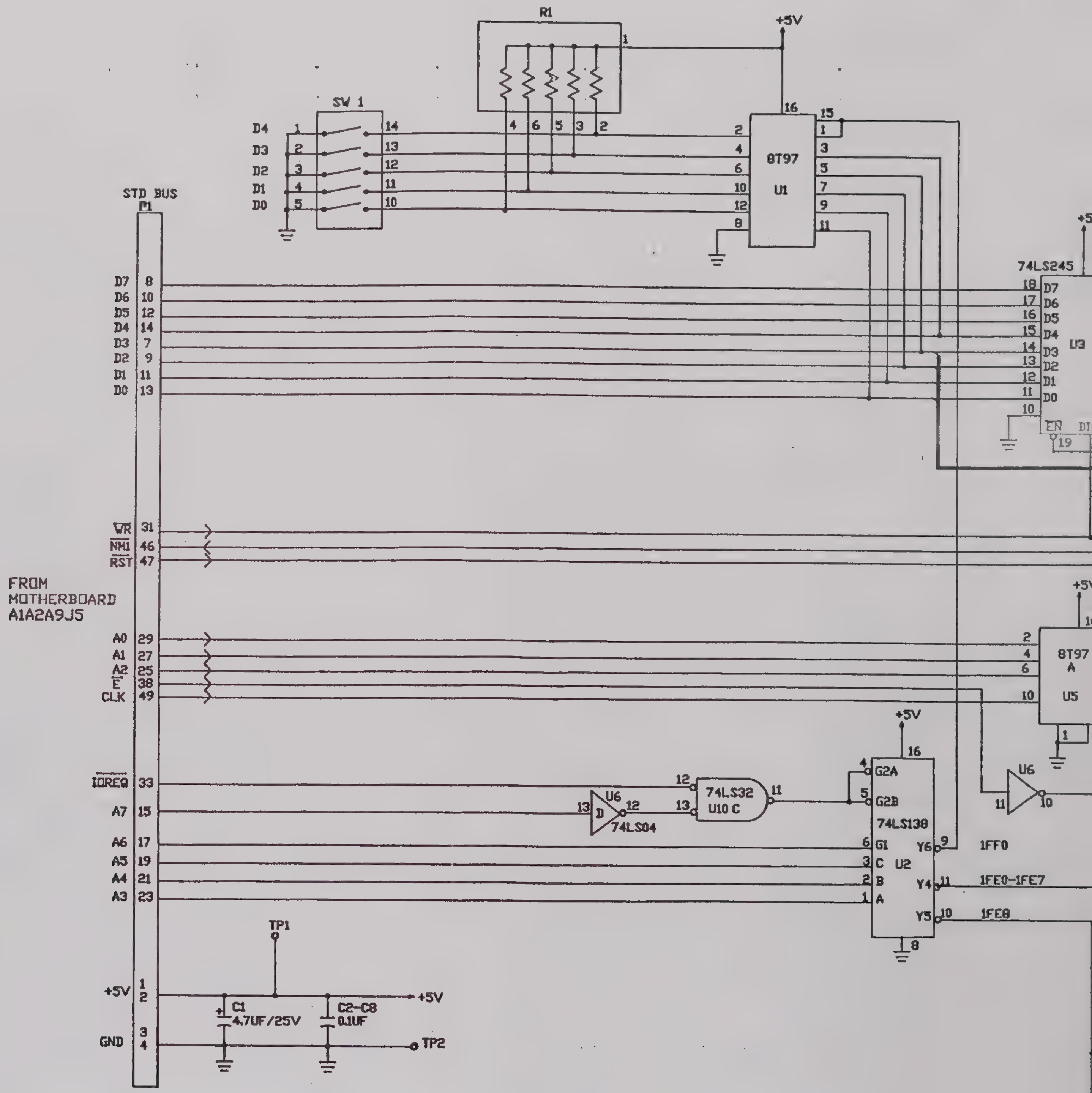

P1
STD BUS
FROM
MOTHERBOARD
A1A2A9 J4
A12 22
A11 24
A10 26
A9 28
A8 30
A7 15
A6 17
A5 19
A4 21
A3 23
A2 25
A1 27
A0 29
+5V 1 2
GND 3 4
D7 8
D6 10
D5 12
D4 14
D3 7
D2 9
D1 11
D0 13
RD 32
MEM RQ 34
A15 16
A14 18
A13 20
74LS244
U1
8T97
U2
TP1
TP2
C1
4.7 UF
16V
C2 THRU C11
0.1UF
+5V
U4
74LS32
74LS138
U3
G1
G2A
G2B
C
B
A
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
2764
U7
U8
U9
U10
U11
U12
A12
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
D7
D6
D5
D4
D3
D2
D1
D0
OE
CS

Figure 7-19. ROM SCHEMATIC A1A2A4


R1
+5V
SW 1
D4
D3
D2
D1
D0
8T97
U1
STD BUS
P1
74LS245
U3
EN
19
D7
D6
D5
D4
D3
D2
D1
D0
WR
NMI
RST
FROM
MOTHERBOARD
A1A2A9J5
A0
A1
A2
E
CLK
8T97
A
U5
IOREQ
A7
A6
A5
A4
A3
U6
74LS04
74LS32
U10 C
G2A
G2B
74LS138
G1
C
B
A
U2
Y6
Y4
Y5
1FF0
1FE0-1FE7
1FE8
TP1
+5V
GND
C1
4.7UF/25V
C2-C8
0.1UF
TP2

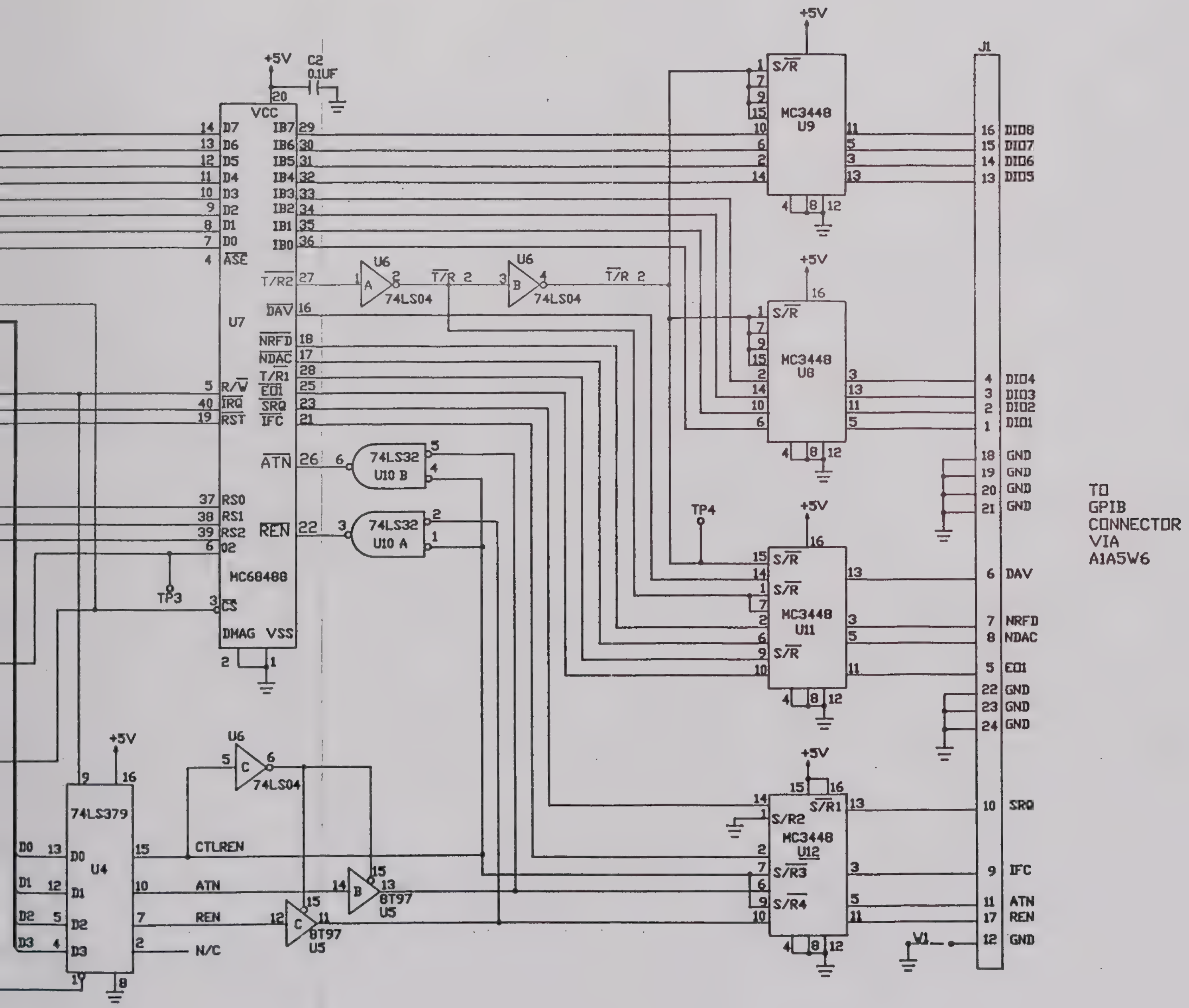

+5V
C2
0.1UF
VCC
MC68488
U7
D7
D6
D5
D4
D3
D2
D1
D0
ASE
IB7
IB6
IB5
IB4
IB3
IB2
IB1
IB0
T/R2
DAV
NRFD
NDAC
T/R1
EOI
SRQ
IFC
ATN
REN
R/W
IRQ
RST
RS0
RS1
RS2
02
CS
DMAG
VSS
TP3
TP4
U6
74LS04
T/R 2
74LS32
U10 B
U10 A
MC3448
U9
U8
U11
U12
S/R
S/R1
S/R2
S/R3
S/R4
74LS379
U4
CTLREN
N/C
8T97
U5
J1
DIO8
DIO7
DIO6
DIO5
DIO4
DIO3
DIO2
DIO1
GND
W1
TO
GPIB
CONNECTOR
VIA
A1A5W6

Figure 7-20. GPIB INTERFACE SCHEMATIC A1A2A5

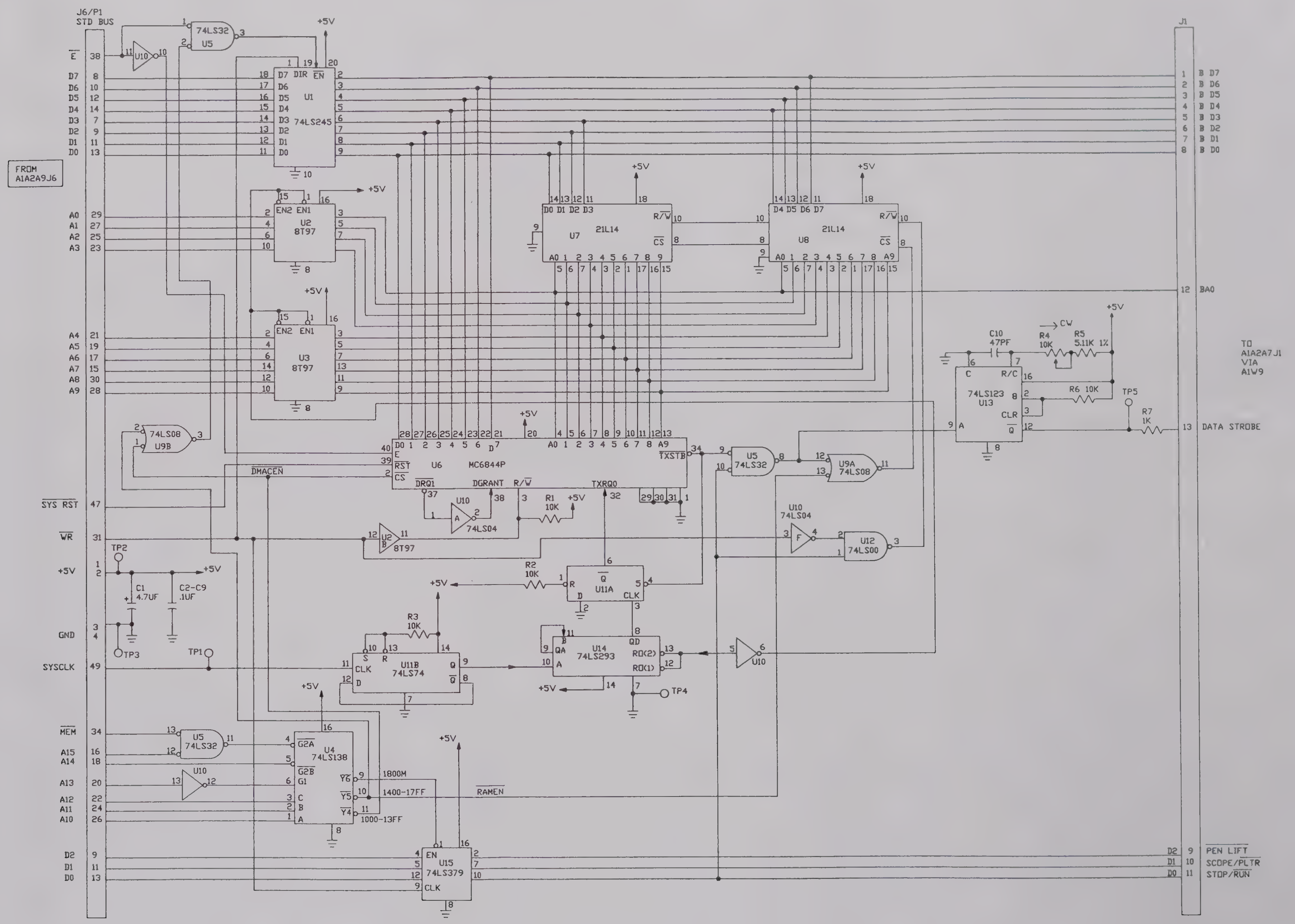

J6/P1
STD BUS
FROM
A1A2A9J6
E
D7
D6
D5
D4
D3
D2
D1
D0
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
SYS RST
WR
+5V
GND
SYSCLK
MEM
A15
A14
A13
A12
A11
A10
D2
D1
D0
74LS32
U5
U10
U1
74LS245
U2
8T97
U3
8T97
74LS08
U9B
U6
MC6844P
DMACEN
DRQ1
DGRANT
R/W
TXRQ0
TXSTB
U10
74LS04
R1
10K
U2
8T97
TP2
TP3
TP1
C1
4.7UF
C2-C9
.1UF
R2
10K
U11A
R3
10K
U11B
74LS74
U14
74LS293
TP4
U5
74LS32
U10
U4
74LS138
1800M
1400-17FF
1000-13FF
RAMEN
U15
74LS379
U7
21L14
U8
21L14
U5
74LS32
U9A
74LS08
U10
74LS04
U12
74LS00
C10
47PF
R4
10K
CW
R5
5.11K 1%
74LS123
U13
R6 10K
TP5
R7
1K
J1
B D7
B D6
B D5
B D4
B D3
B D2
B D1
B D0
BA0
DATA STROBE
TO
A1A2A7J1
VIA
A1W9
PEN LIFT
SCOPE/PLTR
STOP/RUN

Figure 7-21. DMAC AND RAM SCHEMATIC A1A2A6

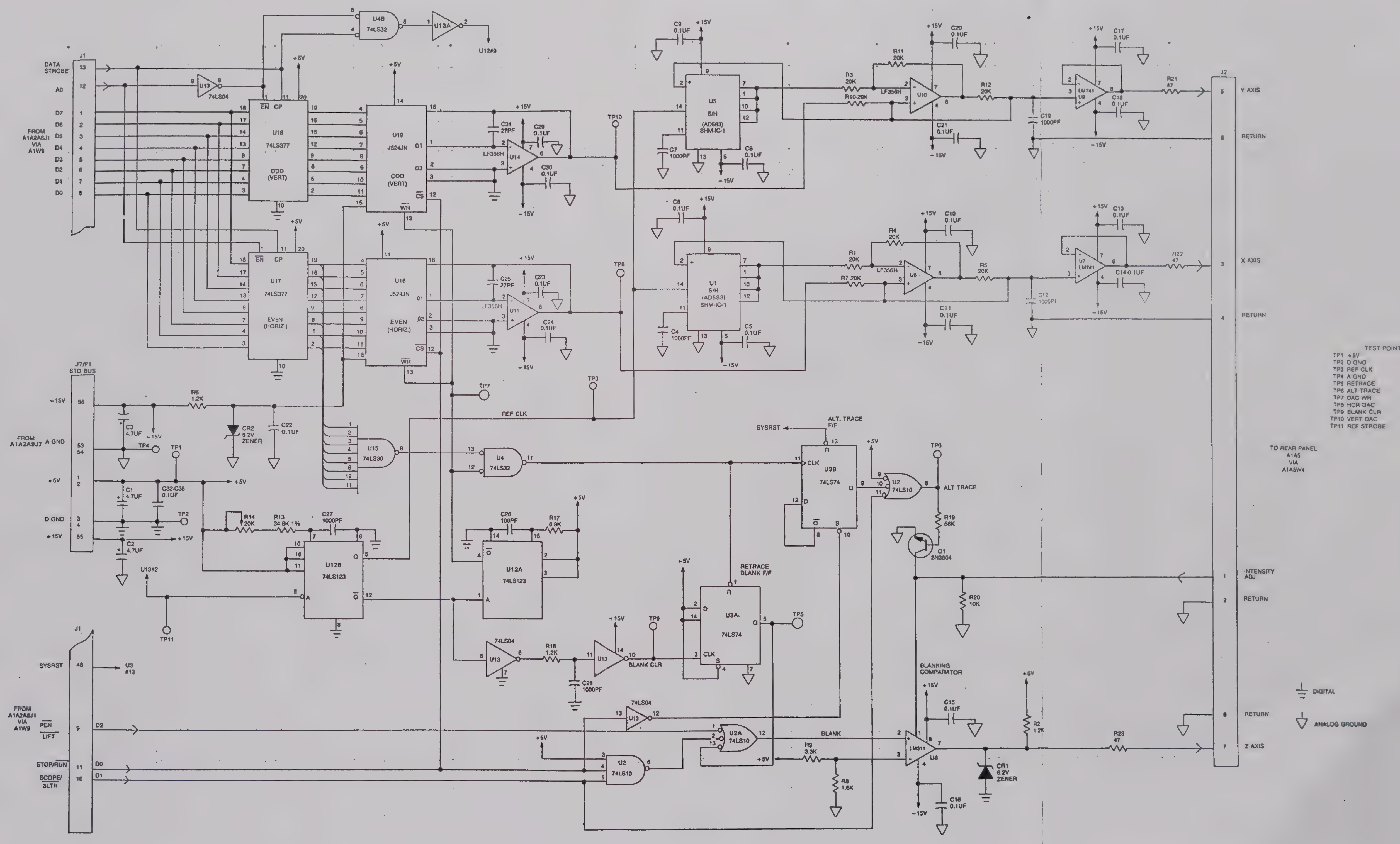

DATA STROBE
A0
D7
D6
D5
D4
D3
D2
D1
D0
FROM A1A2A6J1 VIA A1W9
J1
U13
74LS04
U4B
74LS32
U13A
U12#9
U18
74LS377
ODD (VERT)
U17
74LS377
EVEN (HORIZ.)
U19
J524JN
ODD (VERT)
U16
J524JN
EVEN (HORIZ.)
LF356H
U14
U11
C31 27PF
C29 0.1UF
C30 0.1UF
C25 27PF
C23 0.1UF
C24 0.1UF
U5
S/H (AD583) SHM-IC-1
U1
S/H (AD583) SHM-IC-1
C9 0.1UF
C7 1000PF
C8 0.1UF
C6 0.1UF
C4 1000PF
C5 0.1UF
R3 20K
R10-20K
R11 20K
U10
R12 20K
C20 0.1UF
C21 0.1UF
R1 20K
R7 20K
R4 20K
U6
R5 20K
C10 0.1UF
C11 0.1UF
C19 1000PF
C12 1000PF
U9 LM741
U7 LM741
C17 0.1UF
C18 0.1UF
C13 0.1UF
C14-0.1UF
R21 47
R22 47
J2
Y AXIS
RETURN
X AXIS
RETURN
TEST POINTS
TP1 +5V
TP2 D GND
TP3 REF CLK
TP4 A GND
TP5 RETRACE
TP6 ALT TRACE
TP7 DAC WR
TP8 HOR DAC
TP9 BLANK CLR
TP10 VERT DAC
TP11 REF STROBE
TO REAR PANEL A1A5 VIA A1A5W4
J7/P1 STD BUS
-15V
FROM A1A2A9J7 A GND
+5V
D GND
+15V
R8 1.2K
CR2 6.2V ZENER
C22 0.1UF
C3 4.7UF
C1 4.7UF
C32-C36 0.1UF
C2 4.7UF
U15
74LS30
U4
74LS32
REF CLK
R14 20K
R13 34.8K 1%
C27 1000PF
U12B
74LS123
U12A
74LS123
C26 100PF
R17 6.8K
U13#2
ALT. TRACE F/F
SYSRST
U3B
74LS74
U2
74LS10
ALT TRACE
R19 56K
Q1 2N3904
INTENSITY ADJ
RETURN
R20 10K
RETRACE BLANK F/F
U3A
74LS74
74LS04
R18 1.2K
BLANK CLR
C28 1000PF
U3 #13
PEN LIFT
STOP/RUN
SCOPE/ 3LTR
U2A
74LS10
BLANK
R9 3.3K
R6 1.6K
BLANKING COMPARATOR
LM311
U8
C15 0.1UF
C16 0.1UF
CR1 6.2V ZENER
R2 1.2K
R23 47
RETURN
Z AXIS
DIGITAL
ANALOG GROUND

Figure 7-22. SCOPE DRIVER SCHEMATIC A1A2A7

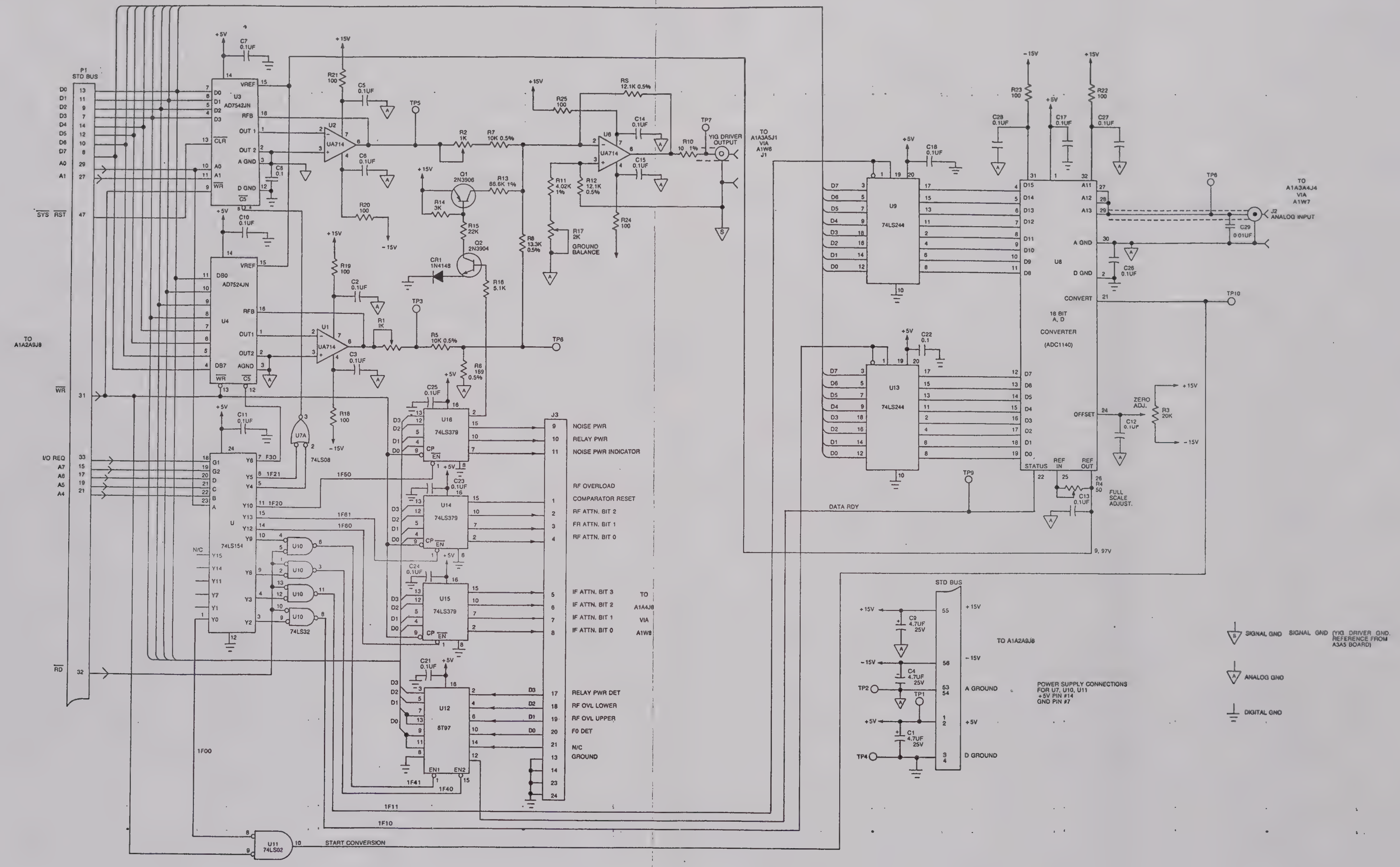

P1 STD BUS
TO A1A2A9J8
U3 AD7542JN
U4 AD7524JN
U2 UA714
U1 UA714
U6 UA714
Q1 2N3906
Q2 2N3904
CR1 1N4148
U7A 74LS08
U 74LS154
U10 74LS32
U16 74LS379
U14 74LS379
U15 74LS379
U12 8T97
U11 74LS02
START CONVERSION
J3
NOISE PWR
RELAY PWR
NOISE PWR INDICATOR
RF OVERLOAD
COMPARATOR RESET
RF ATTN. BIT 2
FR ATTN. BIT 1
RF ATTN. BIT 0
IF ATTN. BIT 3
IF ATTN. BIT 2
IF ATTN. BIT 1
IF ATTN. BIT 0
TO A1A4J8 VIA A1W8
RELAY PWR DET
RF OVL LOWER
RF OVL UPPER
F0 DET
N/C
GROUND
YIG DRIVER OUTPUT
TO A1A3A5J1 VIA A1W6 J1
GROUND BALANCE
U9 74LS244
U13 74LS244
U8 18 BIT A, D CONVERTER (ADC1140)
DATA RDY
ZERO ADJ.
FULL SCALE ADJUST.
TO A1A3A4J4 VIA A1W7
J2 ANALOG INPUT
STD BUS
TO A1A2A9J8
POWER SUPPLY CONNECTIONS FOR U7, U10, U11 +5V PIN #14 GND PIN #7
SIGNAL GND SIGNAL GND (YIG DRIVER GND. REFERENCE FROM A3A5 BOARD)
ANALOG GND
DIGITAL GND

Figure 7-23. ANALOG/DIGITAL I/O SCHEMATIC A1A2A8

]

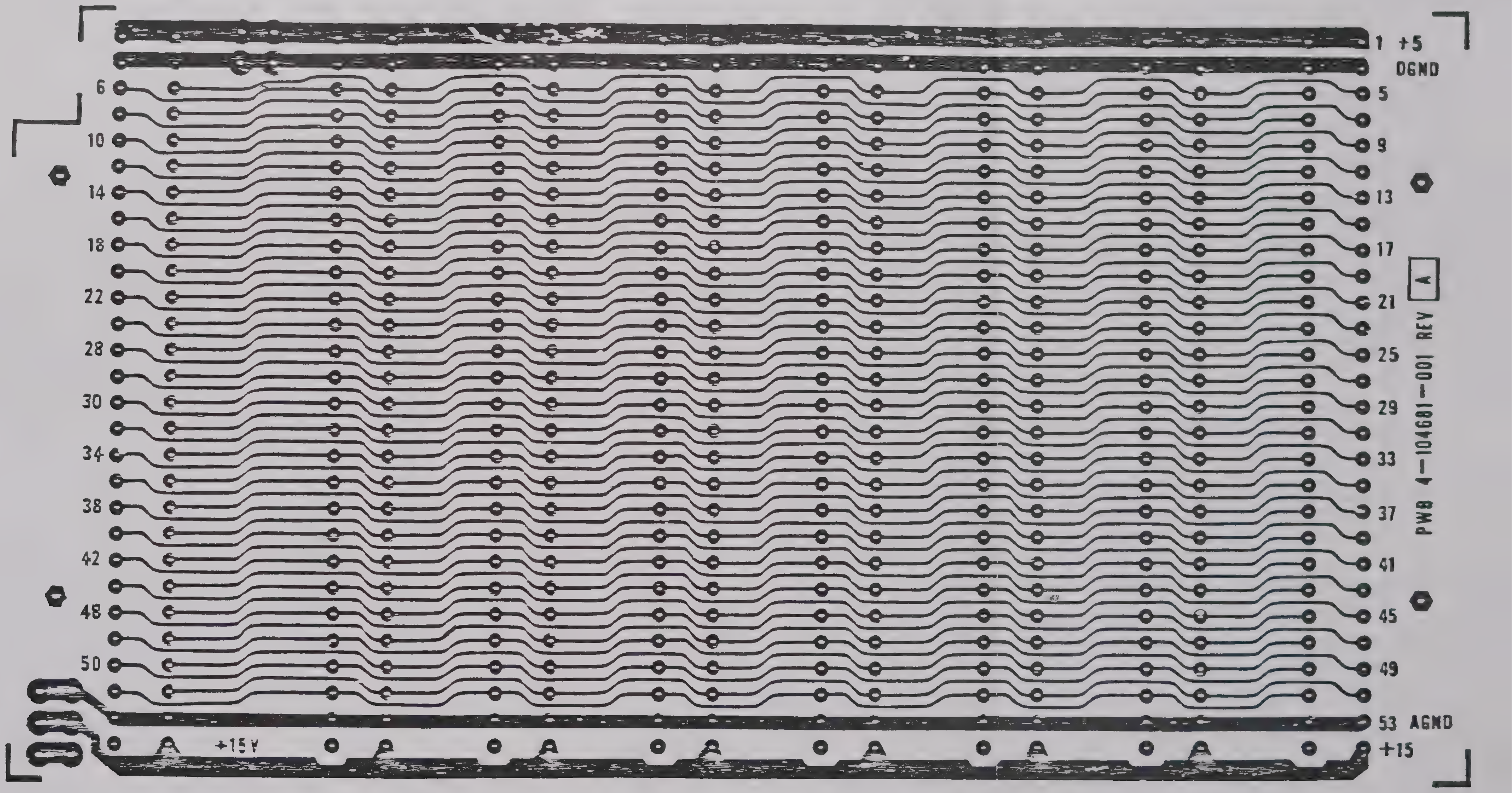

1 +5
DGND
5
9
13
17
21
25
29
33
37
41
45
49
53 AGND
+15
6
10
14
18
22
28
30
34
38
42
48
50
+15V
PWB 4—104681—001 REV A

Figure 7-24. MOTHERBOARD SCHEMATIC A1A2A9

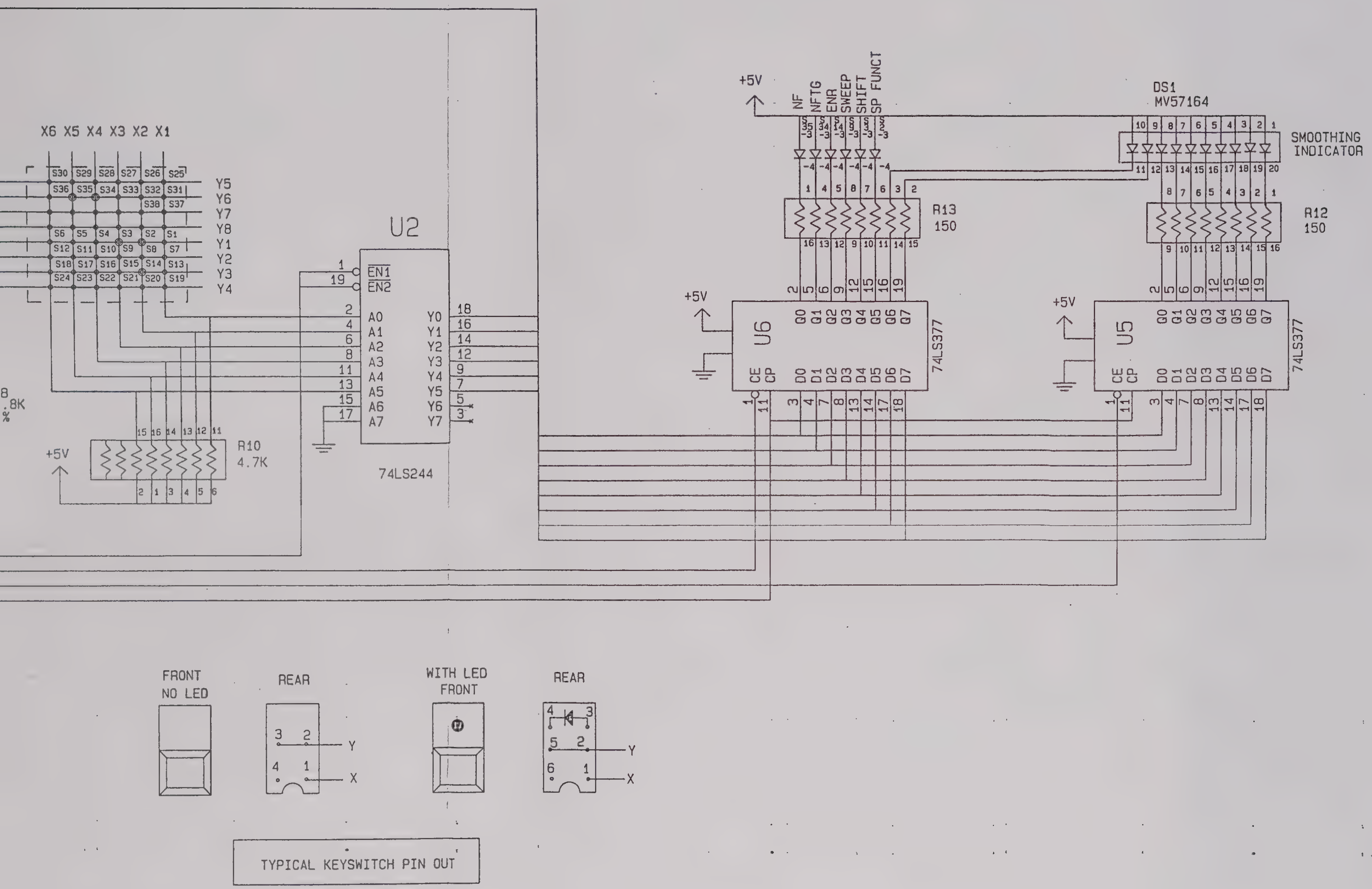
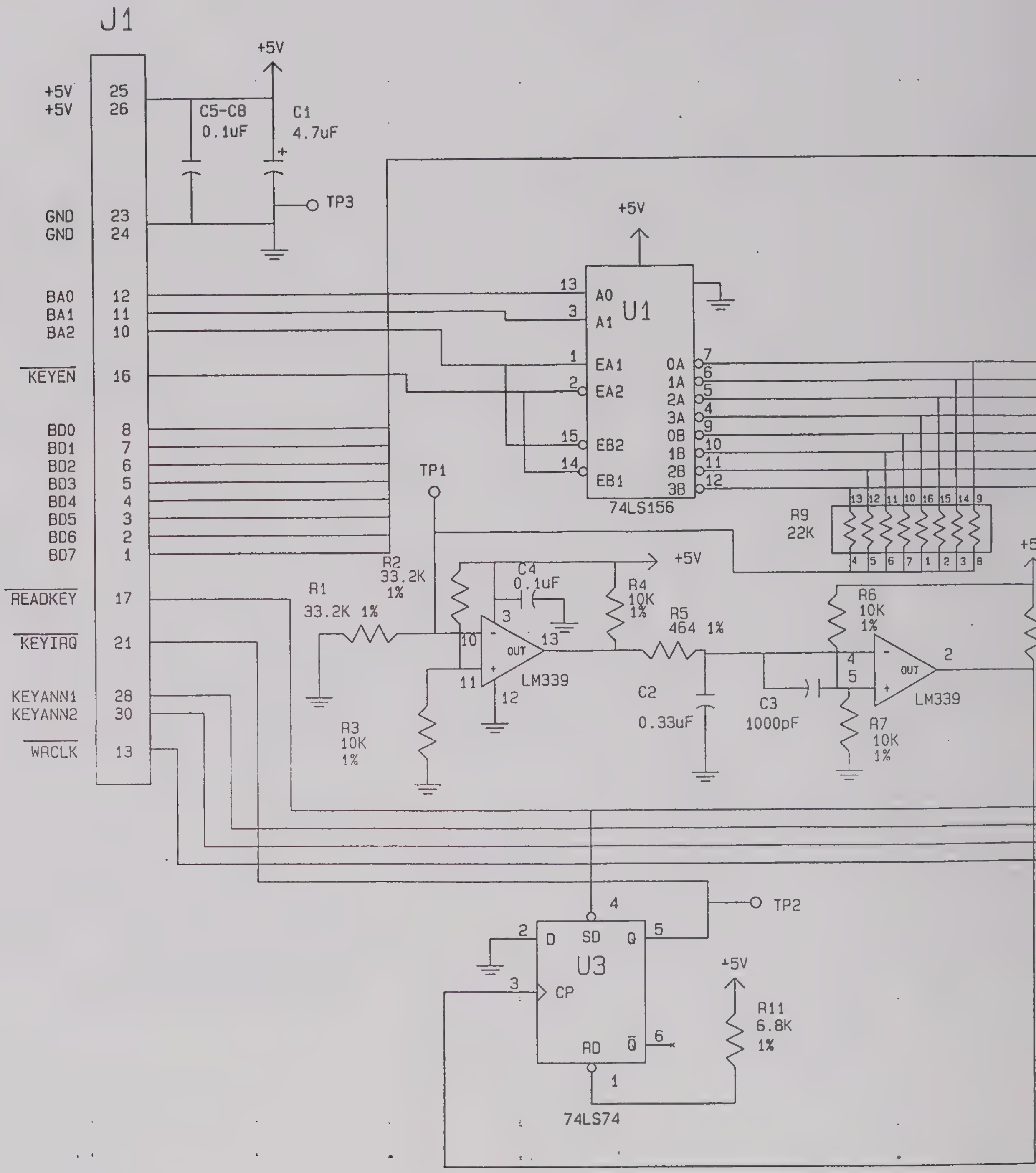

X6 X5 X4 X3 X2 X1
S30 S29 S28 S27 S26 S25
S36 S35 S34 S33 S32 S31
S38 S37
S6 S5 S4 S3 S2 S1
S12 S11 S10 S9 S8 S7
S18 S17 S16 S15 S14 S13
S24 S23 S22 S21 S20 S19
Y5
Y6
Y7
Y8
Y1
Y2
Y3
Y4
.8K
+5V
R10
4.7K
U2
EN1
EN2
A0
A1
A2
A3
A4
A5
A6
A7
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
74LS244
+5V
NF
NFTG
ENR
SWEEP
SHIFT
SP FUNCT
R13
150
U6
Q0
Q1
Q2
Q3
Q4
Q5
Q6
Q7
CE
CP
D0
D1
D2
D3
D4
D5
D6
D7
74LS377
DS1
MV57164
SMOOTHING
INDICATOR
R12
150
U5
74LS377
FRONT
NO LED
REAR
WITH LED
FRONT
REAR
Y
X
TYPICAL KEYSWITCH PIN OUT

Figure 7-25. KEYBOARD SCHEMATIC A1A1A1


J1
+5V 25
+5V 26
GND 23
GND 24
BA0 12
BA1 11
BA2 10
KEYEN 16
BD0 8
BD1 7
BD2 6
BD3 5
BD4 4
BD5 3
BD6 2
BD7 1
READKEY 17
KEYIRQ 21
KEYANN1 28
KEYANN2 30
WRCLK 13
C5-C8 0.1uF
C1 4.7uF
+5V
TP3
TP1
TP2
U1
74LS156
A0 A1 EA1 EA2 EB2 EB1
0A 1A 2A 3A 0B 1B 2B 3B
R9 22K
R1 33.2K 1%
R2 33.2K 1%
R3 10K 1%
R4 10K 1%
R5 464 1%
R6 10K 1%
R7 10K 1%
C2 0.33uF
C3 1000pF
C4 0.1uF
LM339
OUT
U3
74LS74
D SD Q CP RD Q̄
R11 6.8K 1%

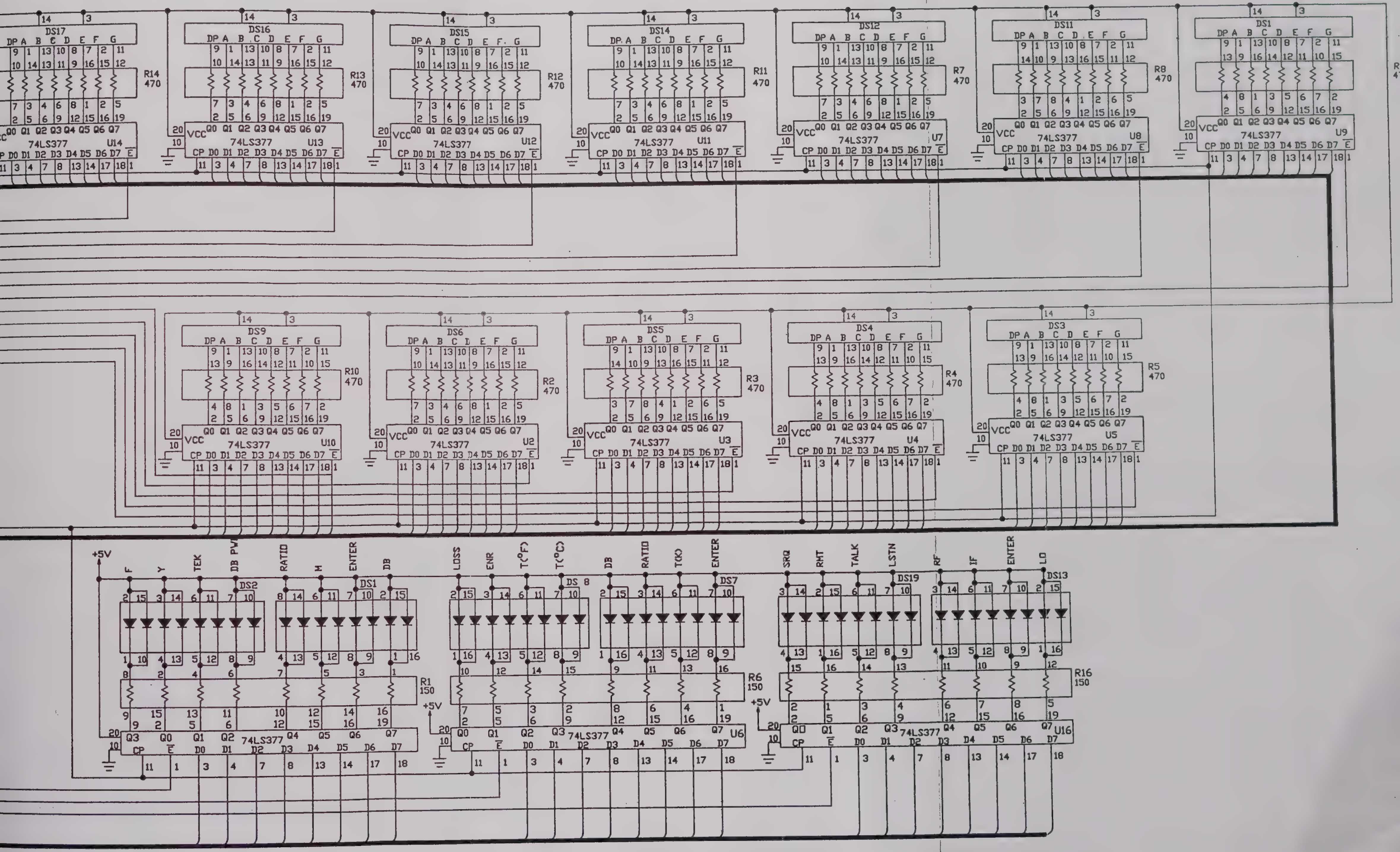
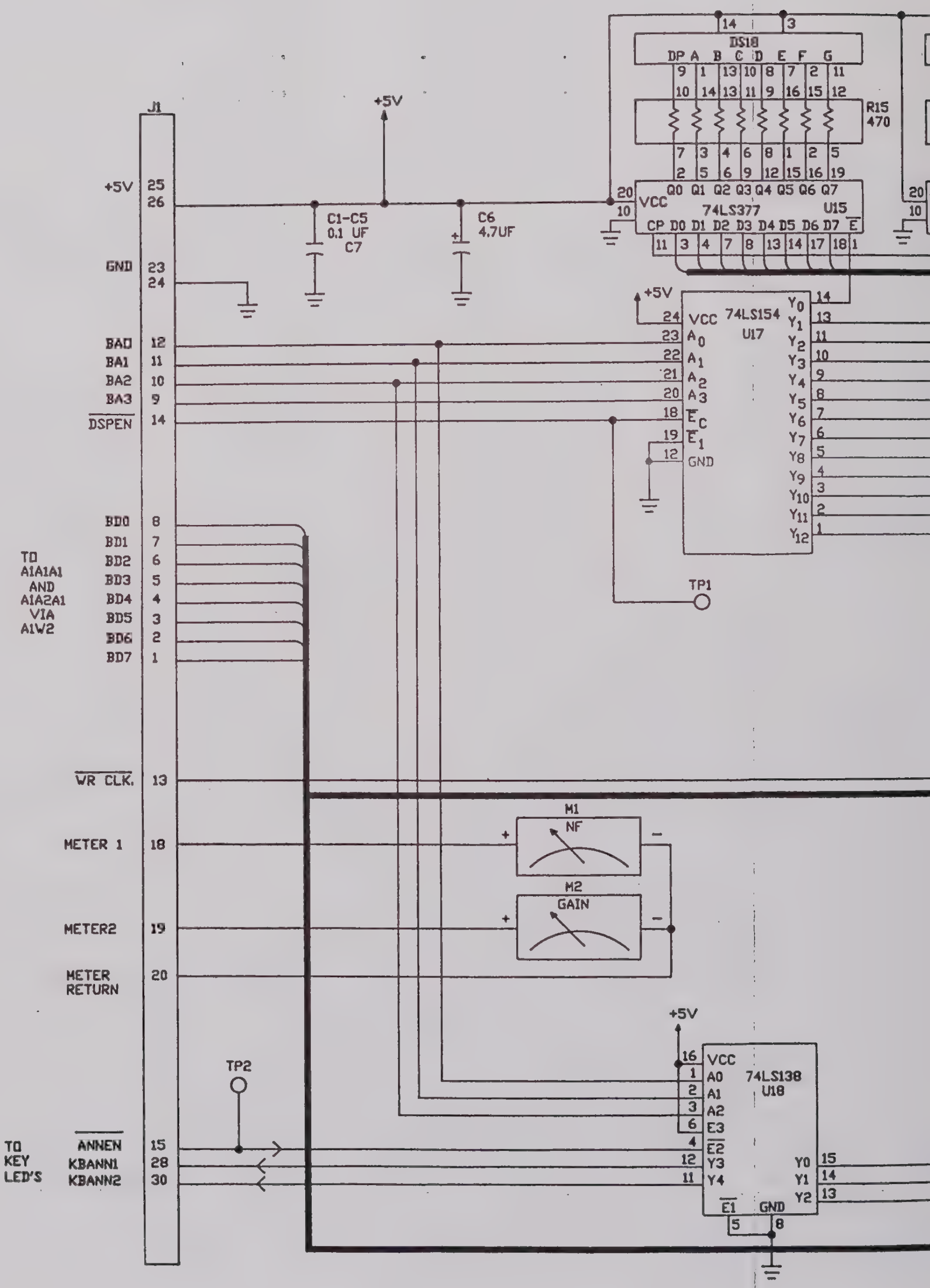
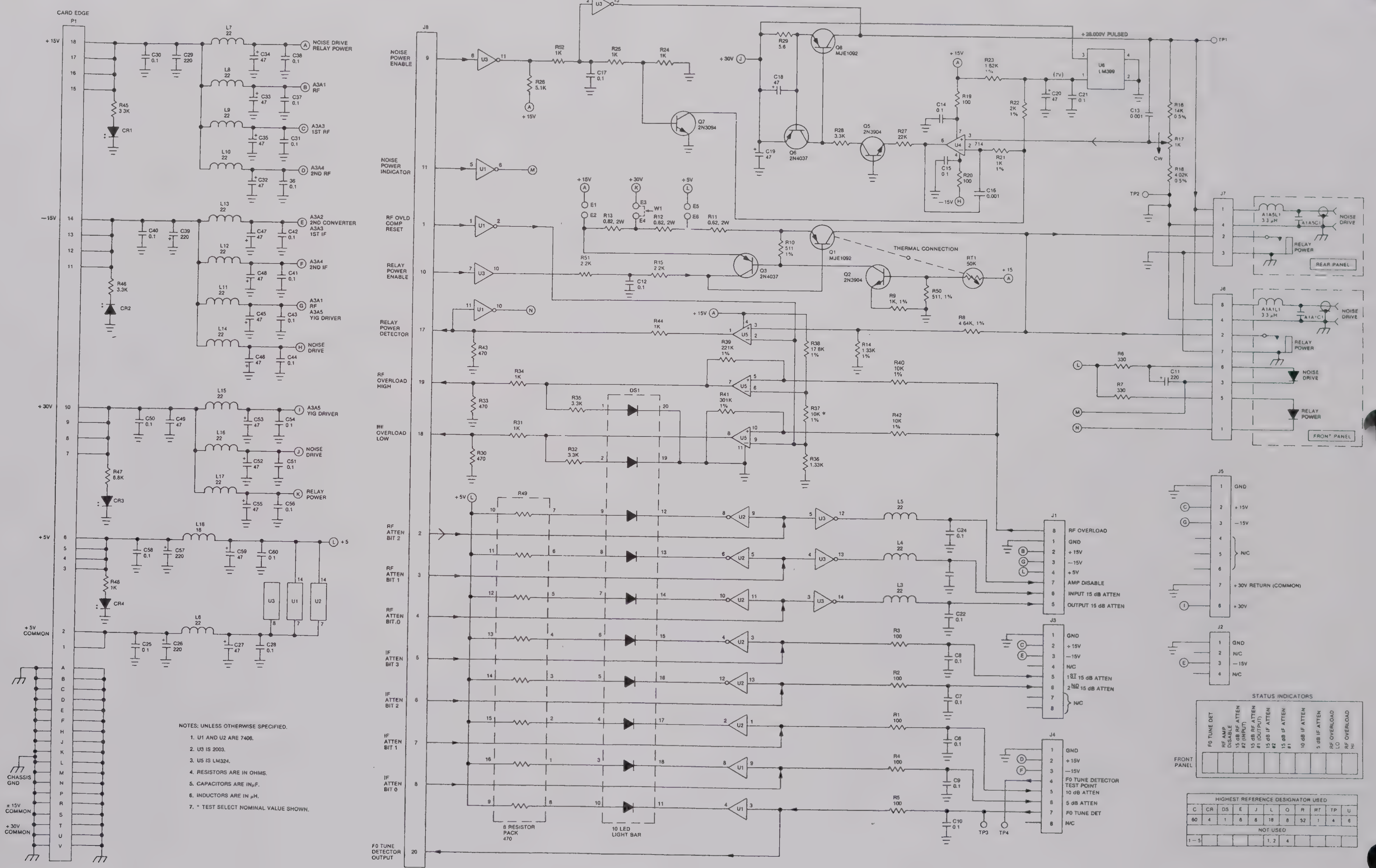

DS17
DS16
DS15
DS14
DS12
DS11
DS1
R14 470
R13 470
R12 470
R11 470
R7 470
R8 470
R9 470
74LS377
U14
U13
U12
U11
U7
U8
U9
DS9
DS6
DS5
DS4
DS3
R10 470
R2 470
R3 470
R4 470
R5 470
U10
U2
U3
U4
U5
DP A B C D E F G
VCC
Q0 Q1 Q2 Q3 Q4 Q5 Q6 Q7
CP D0 D1 D2 D3 D4 D5 D6 D7 E
+5V
F
Y
TEK
DB PWR
RATIO
M
ENTER
DB
DS2
DS1
R1 150
LOSS
ENR
T(°F)
T(°C)
DS 8
DB
RATIO
T(K)
ENTER
DS7
R6 150
U6
SRQ
RMT
TALK
LSTN
DS19
RF
IF
ENTER
LO
DS13
R16 150
U16

Figure 7-26. DISPLAY BOARD SCHEMATIC A1A1A2


J1
+5V 25 26
GND 23 24
BA0 12
BA1 11
BA2 10
BA3 9
DSPEN 14
BD0 8
BD1 7
BD2 6
BD3 5
BD4 4
BD5 3
BD6 2
BD7 1
TO A1A1A1 AND A1A2A1 VIA A1W2
WR CLK. 13
METER 1 18
METER2 19
METER RETURN 20
ANNEN 15
KBANN1 28
KBANN2 30
TO KEY LED'S
TP2
+5V
C1-C5 0.1 UF C7
C6 4.7UF
DS18
DP A B C D E F G
R15 470
74LS377 U15
VCC Q0 Q1 Q2 Q3 Q4 Q5 Q6 Q7
CP D0 D1 D2 D3 D4 D5 D6 D7 E
74LS154 U17
VCC A0 A1 A2 A3 EC E1 GND
Y0 Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8 Y9 Y10 Y11 Y12
TP1
M1 NF
M2 GAIN
74LS138 U18
VCC A0 A1 A2 E3 E2 Y3 Y4 E1 GND
Y0 Y1 Y2


CARD EDGE P1
+15V
−15V
+30V
+5V
+5V COMMON
CHASSIS GND
±15V COMMON
+30V COMMON
NOISE DRIVE RELAY POWER
A3A1 RF
A3A3 1ST RF
A3A4 2ND RF
A3A2 2ND CONVERTER A3A3 1ST IF
A3A4 2ND IF
A3A1 RF A3A5 YIG DRIVER
NOISE DRIVE
A3A5 YIG DRIVER
RELAY POWER
J8
NOISE POWER ENABLE
NOISE POWER INDICATOR
RF OVLD COMP RESET
RELAY POWER ENABLE
RELAY POWER DETECTOR
RF OVERLOAD HIGH
RF OVERLOAD LOW
RF ATTEN BIT 2
RF ATTEN BIT 1
RF ATTEN BIT 0
IF ATTEN BIT 3
IF ATTEN BIT 2
IF ATTEN BIT 1
IF ATTEN BIT 0
F0 TUNE DETECTOR OUTPUT
8 RESISTOR PACK 470
10 LED LIGHT BAR
THERMAL CONNECTION
+38,000V PULSED
TP1
TP2
TP3
TP4
J7
REAR PANEL
FRONT PANEL
J1
RF OVERLOAD
GND
+15V
−15V
+5V
AMP DISABLE
INPUT 15 dB ATTEN
OUTPUT 15 dB ATTEN
J3
N/C
1ST 15 dB ATTEN
2ND 15 dB ATTEN
J4
F0 TUNE DETECTOR TEST POINT
10 dB ATTEN
5 dB ATTEN
F0 TUNE DET
J5
+30V RETURN (COMMON)
J2
STATUS INDICATORS
FRONT PANEL
F0 TUNE DET
RF AMP DISABLE
15 dB RF ATTEN #2 (INPUT)
15 dB RF ATTEN #1 (OUTPUT)
15 dB IF ATTEN #2
15 dB IF ATTEN #1
10 dB IF ATTEN
5 dB IF ATTEN
RF OVERLOAD LO
RF OVERLOAD HI

NOTES: UNLESS OTHERWISE SPECIFIED.

1. U1 AND U2 ARE 7406.
2. U3 IS 2003.
3. U5 IS LM324.
4. RESISTORS ARE IN OHMS.
5. CAPACITORS ARE IN μF.
6. INDUCTORS ARE IN μH.
7. * TEST SELECT NOMINAL VALUE SHOWN.

HIGHEST REFERENCE DESIGNATOR USED										
C	CR	DS	E	J	L	Q	R	RT	TP	U
60	4	1	6	8	18	8	52	1	4	6
NOT USED										
1 – 5					1, 2	4				

Figure 7-27. INTERCONNECTION BOARD SCHEMATIC A1A4

720

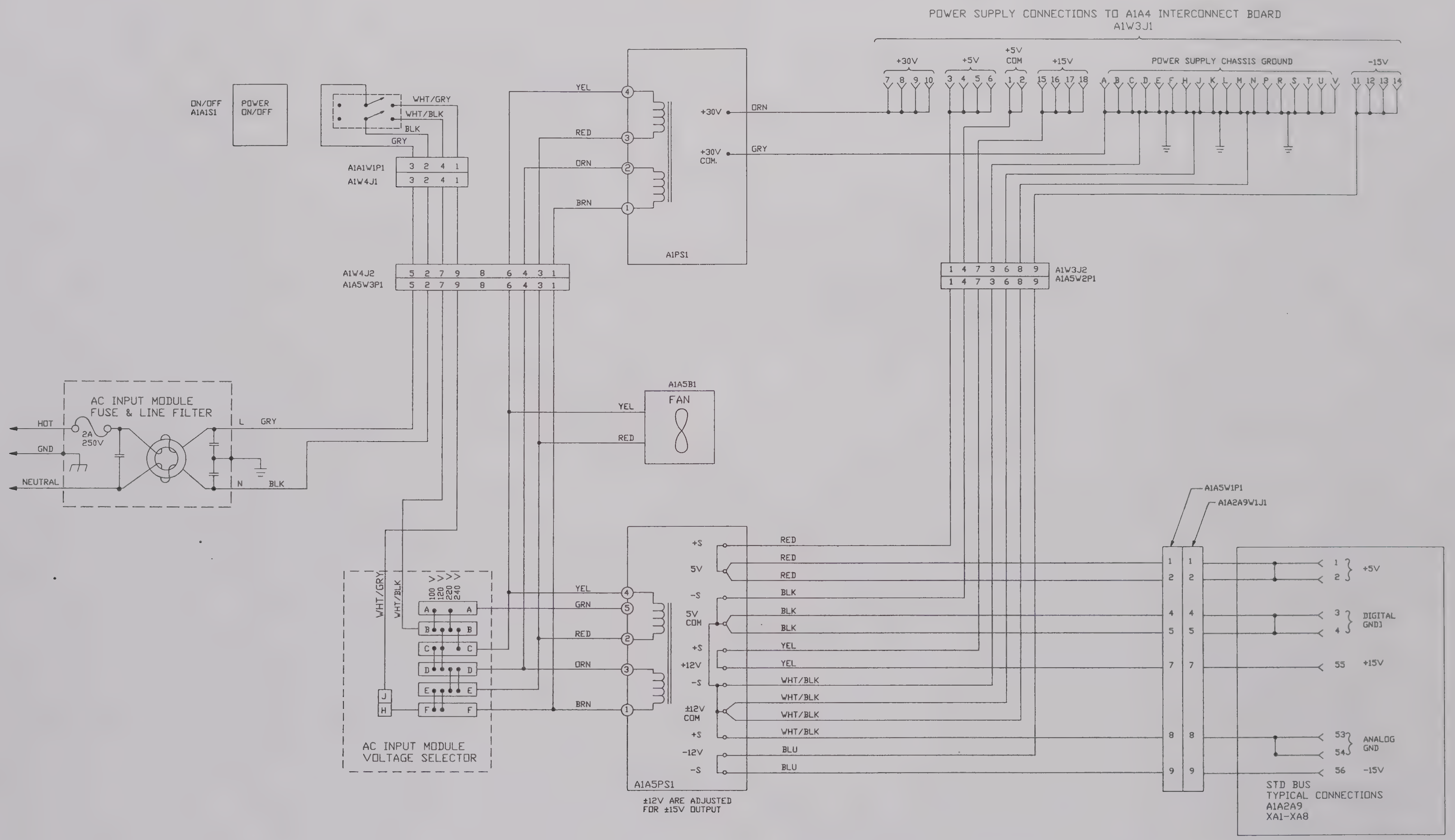

POWER SUPPLY CONNECTIONS TO A1A4 INTERCONNECT BOARD
A1W3J1
+30V
+5V
+5V COM
+15V
POWER SUPPLY CHASSIS GROUND
-15V
7 8 9 10
3 4 5 6
1 2
15 16 17 18
A B C D E F H J K L M N P R S T U V
11 12 13 14
ON/OFF
A1A1S1
POWER ON/OFF
WHT/GRY
WHT/BLK
BLK
GRY
A1A1W1P1
A1W4J1
3 2 4 1
A1W4J2
A1A5W3P1
5 2 7 9 8 6 4 3 1
YEL
RED
ORN
BRN
+30V
+30V COM.
ORN
GRY
A1PS1
A1W3J2
A1A5W2P1
1 4 7 3 6 8 9
AC INPUT MODULE
FUSE & LINE FILTER
HOT
GND
NEUTRAL
2A
250V
L
N
GRY
BLK
A1A5B1
FAN
YEL
RED
A1A5W1P1
A1A2A9W1J1
100
120
220
240
A B C D E F
J
H
AC INPUT MODULE
VOLTAGE SELECTOR
YEL
GRN
RED
ORN
BRN
+S
5V
-S
5V COM
+S
+12V
-S
±12V COM
+S
-12V
-S
A1A5PS1
±12V ARE ADJUSTED FOR ±15V OUTPUT
RED
RED
RED
BLK
BLK
BLK
YEL
YEL
WHT/BLK
WHT/BLK
WHT/BLK
WHT/BLK
BLU
BLU
1 2 4 5 7 8 9
1 +5V
2
3 DIGITAL GND
4
55 +15V
53 ANALOG GND
54
56 -15V
STD BUS
TYPICAL CONNECTIONS
A1A2A9
XA1-XA8

Figure A-2. POWER DISTRIBUTION

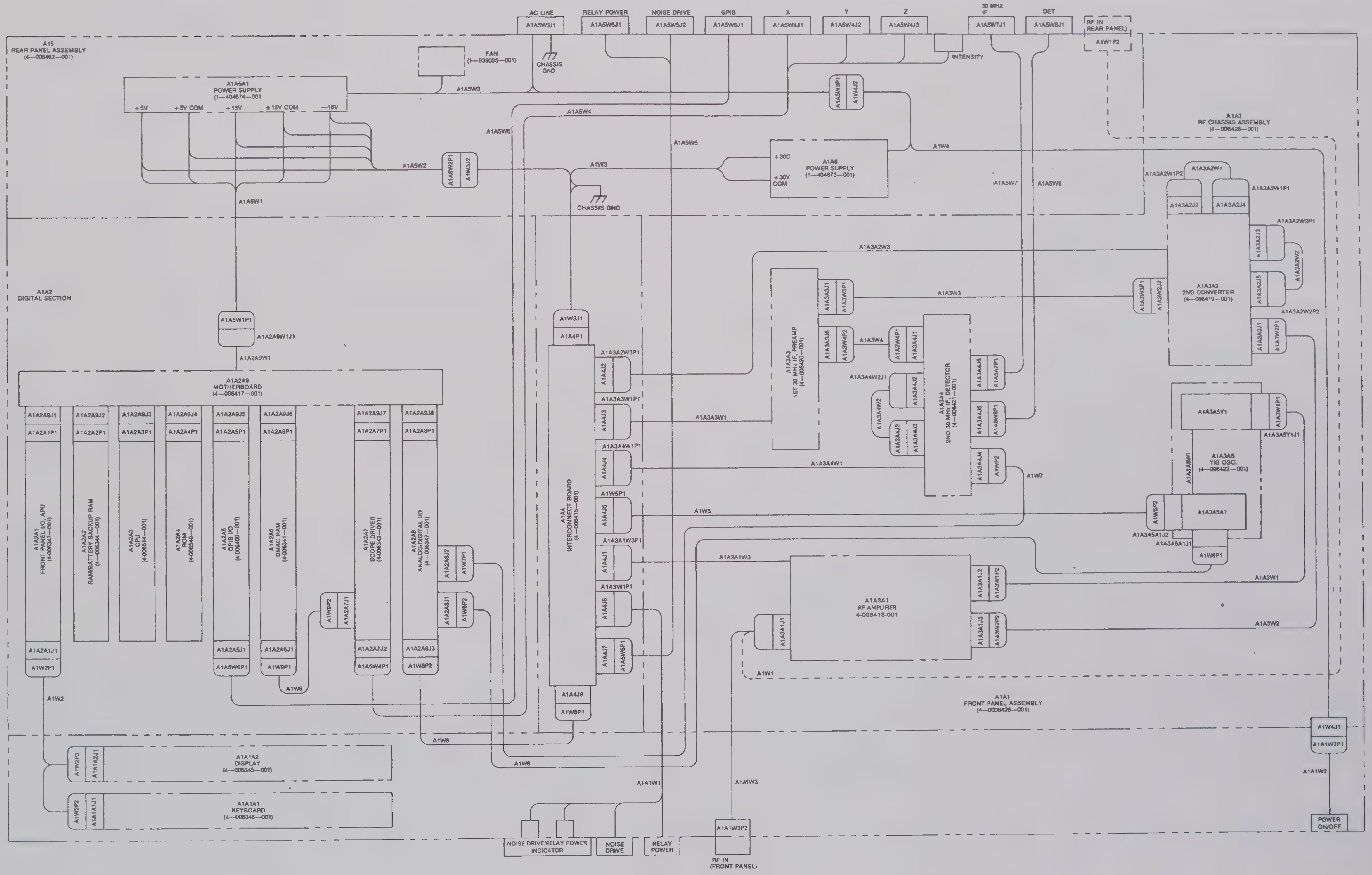

AC LINE
A1A5W3J1
RELAY POWER
A1A5W5J1
NOISE DRIVE
A1A5W5J2
GPIB
A1A5W6J1
X
A1A5W4J1
Y
A1A5W4J2
Z
A1A5W4J3
30 MHz IF
A1A5W7J1
DET
A1A5W8J1
RF IN REAR PANEL)
A1W1P2
A15 REAR PANEL ASSEMBLY (4—006462—001)
FAN (1—939005—001)
CHASSIS GND
INTENSITY
A1A5A1 POWER SUPPLY (1—404674—001
+5V
+5V COM
+15V
±15V COM
−15V
A1A5W3
A1A5W4
A1A5W6
A1A5W5
A1A5W3P1
A1W4J2
A1A5W2
A1A5W2P1
A1W3J2
A1W3
A1W4
A1A8 POWER SUPPLY (1—404673—001)
+30C
+30V COM
A1A5W7
A1A5W8
A1A3 RF CHASSIS ASSEMBLY (4—006428—001)
A1A5W1
A1A2 DIGITAL SECTION
A1A5W1P1
A1A2A9W1J1
A1A2A9W1
A1A2A9 MOTHERBOARD (4—006417—001)
A1A2A9J1
A1A2A1P1
A1A2A1 FRONT PANEL I/O, APU (4-006343—001)
A1A2A1J1
A1W2P1
A1A2A9J2
A1A2A2P1
A1A2A2 RAM/BATTERY BACKUP RAM (4—006344—001)
A1A2A9J3
A1A2A3P1
A1A2A3 CPU (4-006514—001)
A1A2A9J4
A1A2A4P1
A1A2A4 ROM (4-006540—001)
A1A2A9J5
A1A2A5P1
A1A2A5 GPIB I/O (4-006400—001)
A1A2A5J1
A1A5W6P1
A1A2A9J6
A1A2A6P1
A1A2A6 DMAC RAM (4-006341—001)
A1A2A6J1
A1W9P1
A1W9
A1W9P2
A1A2A7J1
A1A2A9J7
A1A2A7P1
A1A2A7 SCOPE DRIVER (4-006342—001)
A1A2A7J2
A1A5W4P1
A1A2A9J8
A1A2A8P1
A1A2A8 ANALOG/DIGITAL I/O (4—006347—001)
A1A2A8J2
A1W7P1
A1A2A8J1
A1W8P2
A1A2A8J3
A1W8P2
A1W2
A1W8
A1W6
A1W3J1
A1A4P1
A1A4 INTERCONNECT BOARD (4—006415—001)
A1A4J8
A1W8P1
A1A3A2W3P1
A1A4J2
A1A3A3W1P1
A1A4J3
A1A3A4W1P1
A1A4J4
A1W5P1
A1A4J5
A1A3A1W3P1
A1A4J1
A1A3W1P1
A1A4J6
A1A4J7
A1A5W5P1
A1A3A2W3
A1A3W3
A1A3A3W1
A1A3A4W1
A1W5
A1A3A1W3
A1A3A3J1
A1A3W3P1
A1A3A3 1ST 30 MHz IF. PREAMP (4—006420—001)
A1A3A3J6
A1A3W4P2
A1A3W4
A1A3W4P1
A1A3A4J1
A1A3A4W2J1
A1A3A4W2
A1A3A4J2
A1A3A4J3
A1A3A4 2ND 30 MHz IF. DETECTOR (4—006421—001)
A1A3A4J6
A1A5A7P1
A1A3A4J5
A1A5W8P1
A1A3A4J4
A1W7P2
A1W7
A1A3A2W1P2
A1A3A2W1
A1A3A2W1P1
A1A3A2J2
A1A3A2J4
A1A3A2W2P1
A1A3A2J3
A1A3A2W2
A1A3A2J5
A1A3A2W2P2
A1A3W3P1
A1A3W2J2
A1A3A2 2ND CONVERTER (4—006419—001)
A1A3A2J1
A1A3W2P1
A1A3A5Y1
A1A3W1P1
A1A3A5Y1J1
A1A3A5W1
A1A3A5 YIG OSC. (4—006422—001)
A1W5P2
A1A3A5A1
A1A3A5A1J2
A1A3A5A1J1
A1W6P1
A1A3W1
A1A3W2
A1A3A1J1
A1A3A1 RF AMPLIFIER 4-008418-001
A1A3A1J2
A1A3W1P2
A1A3A1J3
A1A3W2P2
A1W1
A1A1 FRONT PANEL ASSEMBLY (4—006426—001)
A1W4J1
A1A1W2P1
A1A1W2
POWER ON/OFF
A1W2P3
A1A1A2J1
A1A1A2 DISPLAY (4—006345—001)
A1W2P2
A1A1A1J1
A1A1A1 KEYBOARD (4—006346—001)
A1A1W1
A1A1W3
NOISE DRIVE/RELAY POWER INDICATOR
NOISE DRIVE
RELAY POWER
A1A1W3P2
RF IN (FRONT PANEL)

Figure A-1. CABLING DIAGRAM

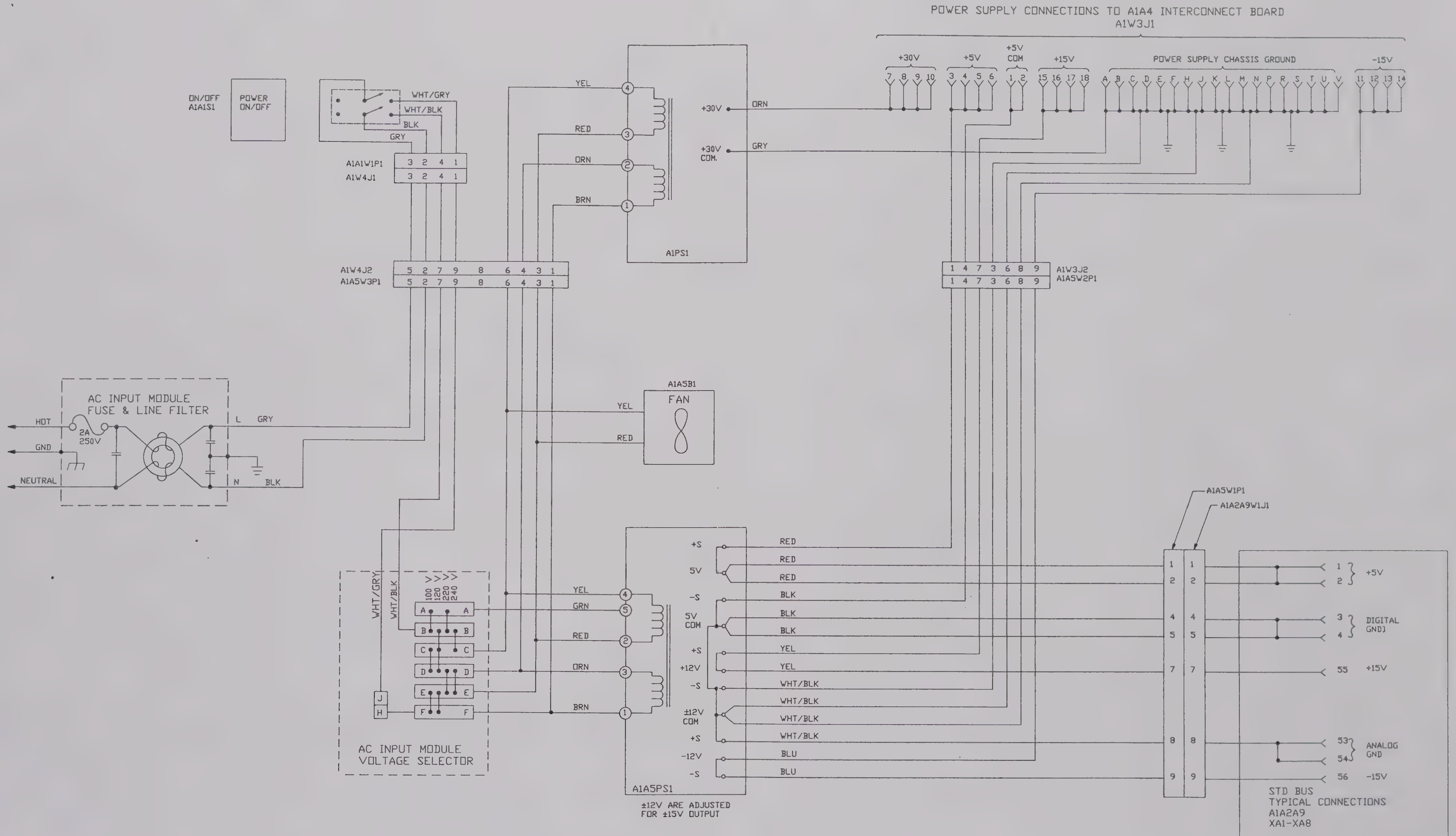
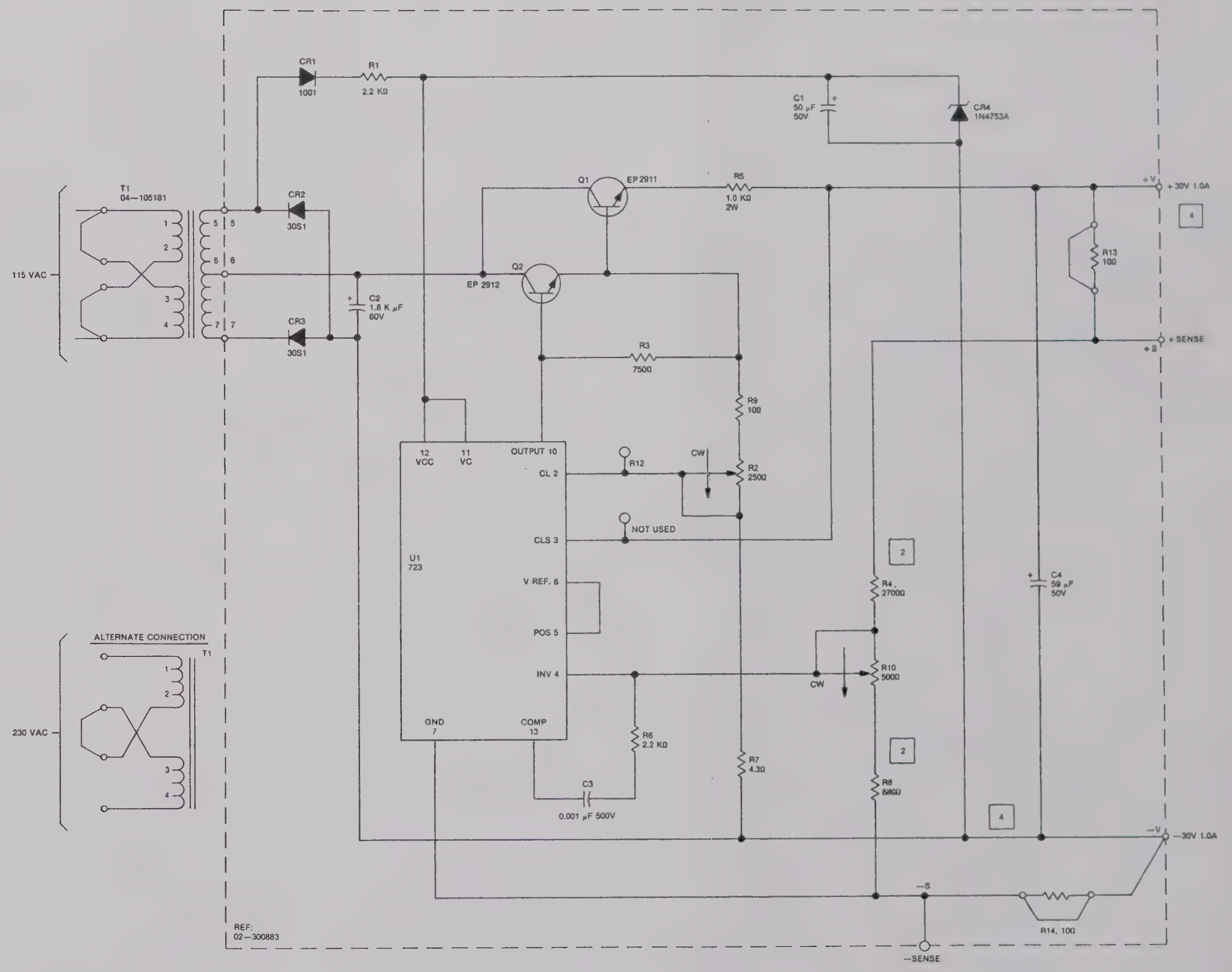

POWER SUPPLY CONNECTIONS TO A1A4 INTERCONNECT BOARD
A1W3J1
+30V
+5V
+5V COM
+15V
POWER SUPPLY CHASSIS GROUND
-15V
7 8 9 10
3 4 5 6
1 2
15 16 17 18
A B C D E F H J K L M N P R S T U V
11 12 13 14
ON/OFF
A1A1S1
POWER ON/OFF
WHT/GRY
WHT/BLK
BLK
GRY
A1A1W1P1
A1W4J1
3 2 4 1
YEL
RED
ORN
BRN
+30V
+30V COM.
ORN
GRY
A1PS1
A1W4J2
A1A5W3P1
5 2 7 9 8 6 4 3 1
1 4 7 3 6 8 9
A1W3J2
A1A5W2P1
AC INPUT MODULE
FUSE & LINE FILTER
HOT
GND
NEUTRAL
2A
250V
L
N
GRY
BLK
A1A5B1
FAN
YEL
RED
A1A5W1P1
A1A2A9W1J1
AC INPUT MODULE
VOLTAGE SELECTOR
100 V
120 V
220 V
240 V
A B C D E F
J H
GRN
+S
5V
-S
5V COM
+S
+12V
-S
±12V COM
+S
-12V
-S
A1A5PS1
±12V ARE ADJUSTED
FOR ±15V OUTPUT
RED
BLK
YEL
WHT/BLK
BLU
1 2 4 5 7 8 9
1 2 +5V
3 4 DIGITAL GND
55 +15V
53 54 ANALOG GND
56 -15V
STD BUS
TYPICAL CONNECTIONS
A1A2A9
XA1-XA8

Figure A-2. POWER DISTRIBUTION

7-32

PRORIETARY NOTICE

All patent or other proprietary rights pertaining to the items sold hereunder shall remain the sole property of Standard Power, Inc., except that the purchaser shall have the right to use such items for their intended purposes.


T1
04—105181
115 VAC
1
2
3
4
5
6
7
CR1
1001
R1
2.2 KΩ
CR2
30S1
CR3
30S1
C2
1.8 K µF
60V
Q1
EP 2911
Q2
EP 2912
R5
1.0 KΩ
2W
C1
50 µF
50V
CR4
1N4753A
+V
+30V 1.0A
R13
10Ω
+S
+ SENSE
R3
750Ω
R9
10Ω
R2
250Ω
CW
R12
NOT USED
12
VCC
11
VC
OUTPUT 10
CL 2
CLS 3
U1
723
V REF. 6
POS 5
INV 4
GND
7
COMP
13
R6
2.2 KΩ
C3
0.001 µF 500V
R7
4.3Ω
R4
2700Ω
R10
500Ω
CW
R8
C4
59 µF
50V
2
2
4
4
−V
−30V 1.0A
−S
R14, 10Ω
−SENSE
REF:
02—300883
ALTERNATE CONNECTION
T1
230 VAC
1
2
3
4

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE 1/2W, ±2%.
2. METALFILM RESISTORS 1/2W ±2%.
3. REFERENCE ASSEMBLY. 02—300883.
4. FOR REMOTE SENSE OPTION, BUT TRACE ACROSS R13 AND R14 AND INSTALL RESISTORS

Figure A-3. +30 V POWER SUPPLY SCHEMATIC

COMPONENT PARTS LIST
ETV 401

Ref Designator	Description	Suggested Manufacturer/Type		ACDC P/N
T1	TRANSFORMER	ACDC		52626
Q2	TRANSISTOR	RCA	2N3771	54—031—016
Q4, 6	TRANSISTOR	RCA	2N3055	54—031—003
C2	CAPACITOR	SPRAGUE 36DX9067	16000/15V	57—025—163
PCB ASSEMBLY 70—659—001				
C1	CAPACITOR	ILLINOIS 108RAR016B	1000/16V	62—708—024
C3, 7	CAPACITOR	SPRAGUE 10TS—D68	0068/1000V	52—231—682
C4	CAPACITOR	ILLINOIS 227RAR016B	220/16V	62—708—025
C5, 6	CAPACITOR	ILLINOIS 228TTA050B	2200/50V	54—032—037
C8	CAPACITOR	SPRAGUE 5HKS—S10	0.01/100V	52—231—103
C9	CAPACITOR	KEMET C320C332K2R	0.0033/100V	67—159—332
C10, 11	CAPACITOR	ILLINOIS 107RAR035B	100/35V	62—708—026
CR1, 6—12	DIODE	MOTOROLA	1N4004	50—464—003
CR2, 3	DIODE	MOTOROLA	MR751	50—464—095
CR4	DIODE	MOTOROLA	1N752A	51—739—018
CR5	DIODE	RCA	C122F	52—714—042
R1	RESISTOR		470Ω 1/2W 5%	50—461—471
R2	RESISTOR		2.2K 1/2W 5%	50—461—222
R3	RESISTOR		2.7Ω 1/2W 5%	50—461—279
R4	RESISTOR		22Ω 1/2W 5%	50—461—220
R6	RESISTOR		3.9K 1/2W 5%	50—461—392
R7, 8, 11	RESISTOR		2.15K 1/8W 1%	50—354—333
R10	JUMPER			
R12	RESISTOR		22Ω 1/2W 5%	50—461—220
R13, 14, 25, 26	RESISTOR		6.8Ω 1/2W 5%	50—461—689
R15	RESISTOR		1K 1/2W 5%	50—461—102
R16, 17, 19, 27, 28	RESISTOR		330Ω 1/2W 5%	50—461—331
R18	RESISTOR		4.7K 1/2W 5%	50—461—472
R20, 33	RESISTOR		0.56Ω 2W	52—064—568
R21, 34	RESISTOR		1.6K 1/2W 5%	50—461—162
R23	RESISTOR		1.74K 1/8W 1%	54—354—324
R24	RESISTOR		4.22K 1/8W 1%	54—354—361
R29	RESISTOR		4.7K 1/2W 5%	50—461—472
R30	RESISTOR		2.7K 1/2W 5%	50—461—272
R31	RESISTOR		240Ω 1/2W 5%	50—461—241
R32	RESISTOR		3.9Ω 1/2W 5%	50—461—399
R35	RESISTOR		1.6K 1/2W 5%	50—461—162
R36	RESISTOR		2.2K 1/2W 5%	50—461—222
R38	RESISTOR		412Ω 1/8W 1%	54—354—260
R39	RESISTOR		3.24K 1/8W 1%	54—354—350
R40, 41	RESISTOR		6.8Ω 1/2W 5%	50—461—689
R5, 9, 22, 37	POT		5K	59—561—502
IC1, 2, 3	REGULATOR		µA 723	86—780—000
Q1	TRANSISTOR	RCA	TIP31A	54—031—074
Q3, 5	TRANSISTOR	MOTOROLA	2N2907A	52—725—004

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SPECIFICATIONS-ETV SERIES, CASE TD

AC INPUT: 100/117/220/230/240 VAC, 47—440 Hz
(Derate 10% for 50 Hz operation)

FUSING: See chart

DC OUTPUT: See chart; output #3 programmable to —5 volts.*

LINE REGULATION: ±0.05% for ±10% line change

LOAD REGULATION: ±0.05% for 50% load change

OUTPUT RIPPLE: 3 mV Pk-Pk, 2 mV RMS (max.)

TRANSIENT RESPONSE: 30 µsec for 50% load change

OVERLOAD AND SHORT CIRCUIT PROTECTION: (Current limiting and foldback. Recovery automatic.

OVERVOLTAGE PROTECTION: Standard on +5V output. (Preset at 6.2 ±0.4V, fixed.) Optional on outputs 2 and 3 (adjustable).

TEMPERTURE RATING: Full rating, 0—50°C in free air. Derate linearly to 40% at 70°C.

TEMPERATURE COEFFICIENT: 0.02%/°C max.

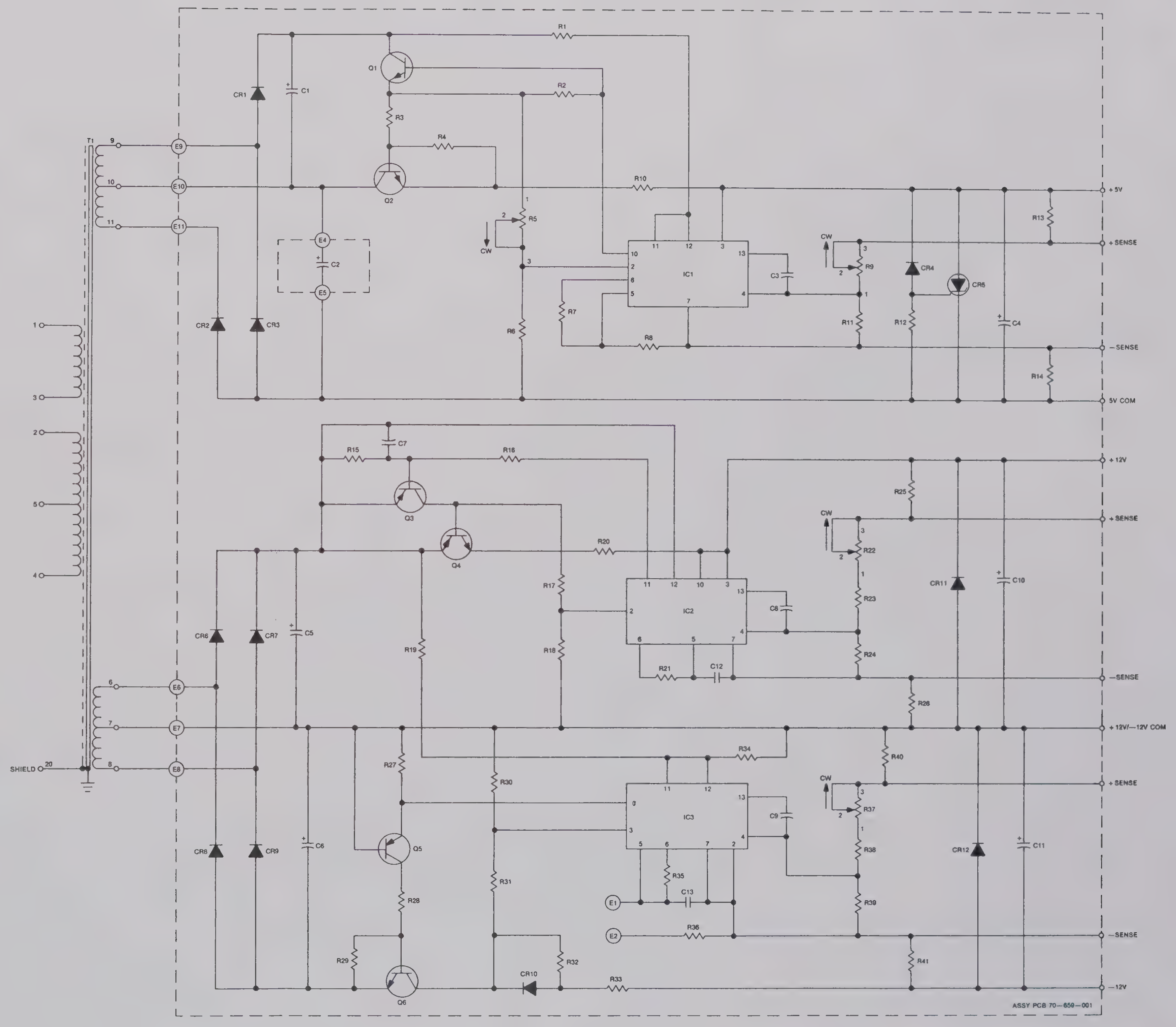
REMOTE SENSING: Available on all outputs.

VIBRATION: Per Mil-Std-810C, method 514 2, proc. X, Curve AW (to 50 Hz)

SHOCK: Per Mil-Std-810B, method 516, proc. V.

⚠1 All units are factory adjusted for 12 volts outputs. (Adjustment range is 10V to 18V)

*For —5V output, jumper E1 to E2 and adjust output voltage pot.


T1
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2
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SHIELD
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E9
E10
E11
E6
E7
E8
E4
E5
E1
E2
CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
CR10
CR11
CR12
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
Q1
Q2
Q3
Q4
Q5
Q6
IC1
IC2
IC3
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
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R14
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R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
R40
R41
CW
+5V
+SENSE
—SENSE
5V COM
+12V
+SENSE
—SENSE
+12V/—12V COM
+SENSE
—SENSE
—12V
ASSY PCB 70—659—001

Figure A-4. +5 V, ± 15 V POWER SUPPLY SCHEMATIC

COMPONENT PARTS LIST
ETV 401

Ref. Designator	Description	Suggested Manufacturer/Type		ACDC P/N
T1	TRANSFORMER	ACDC		52626
Q2	TRANSISTOR	RCA	2N3771	54—031—016
Q4, 6	TRANSISTOR	RCA	2N3055	54—031—003
C2	CAPACITOR	SPRAGUE 36DX9087	16000/15V	57—025—163
PCB ASSEMBLY 70—659—001				
C1	CAPACITOR	ILLINOIS 108RAR016B	1000/16V	62—708—024
C3, 7	CAPACITOR	SPRAGUE 10TS—D68	0068/1000V	52—231—682
C4	CAPACITOR	ILLINOIS 227RAR016B	220/16V	62—708—025
C5, 6	CAPACITOR	ILLINOIS 228TTA050B	2200/50V	54—032—037
C8	CAPACITOR	SPRAGUE 5HKS—S10	0.01/100V	52—231—103
C9	CAPACITOR	KEMET C320C332K2R	0.0033/100V	67—159—332
C10, 11	CAPACITOR	ILLINOIS 107RAR035B	100/35V	62—708—026
CR1, 6—12	DIODE	MOTOROLA	1N4004	50—464—003
CR2, 3	DIODE	MOTOROLA	MR751	50—464—095
CR4	DIODE	MOTOROLA	1N752A	51—739—018
CR5	DIODE	RCA	C122F	52—714—042
R1	RESISTOR		470Ω 1/2W 5%	50—461—471
R2	RESISTOR		2.2K 1/2W 5%	50—461—222
R3	RESISTOR		2.7Ω 1/2W 5%	50—461—279
R4	RESISTOR		22Ω 1/2W 5%	50—461—220
R6	RESISTOR		3.9K 1/2W 5%	50—461—392
R7, 8, 11	RESISTOR		2.15K 1/8W 1%	50—354—333
R10	JUMPER			
R12	RESISTOR		22Ω 1/2W 5%	50—461—220
R13, 14, 25, 26	RESISTOR		6.8Ω 1/2W 5%	50—461—689
R15	RESISTOR		1K 1/2W 5%	50—461—102
R16, 17, 19, 27, 28	RESISTOR		330Ω 1/2W 5%	50—461—331
R18	RESISTOR		4.7K 1/2W 5%	50—461—472
R20,2 3	RESISTOR		0.56Ω 2W	52—064—568
R21, 34	RESISTOR		1.6K 1/2W 5%	50—461—162
R23	RESISTOR		1.74K 1/8W 1%	54—354—324
R24	RESISTOR		4.22K 1/8W 1%	54—354—361
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R36	RESISTOR		2.2K 1/2W 5%	50—461—222
R38	RESISTOR		412Ω 1/8W 1%	54—354—260
R39	RESISTOR		3.24K 1/8W 1%	54—354—350
R40, 41	RESISTOR		6.8Ω 1/2W 5%	50—461—689
R5, 9, 22, 37	POT		5K	59—561—502
IC1, 2, 3	REGULATOR		μA 723	66—780—000
Q1	TRANSISTOR	RCA	TIP31A	54—031—074
Q3, 5	TRANSISTOR	MOTOROLA	2N2907A	52—725—004

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TEMPERATURE COEFFICIENT: 0.02%/°C max

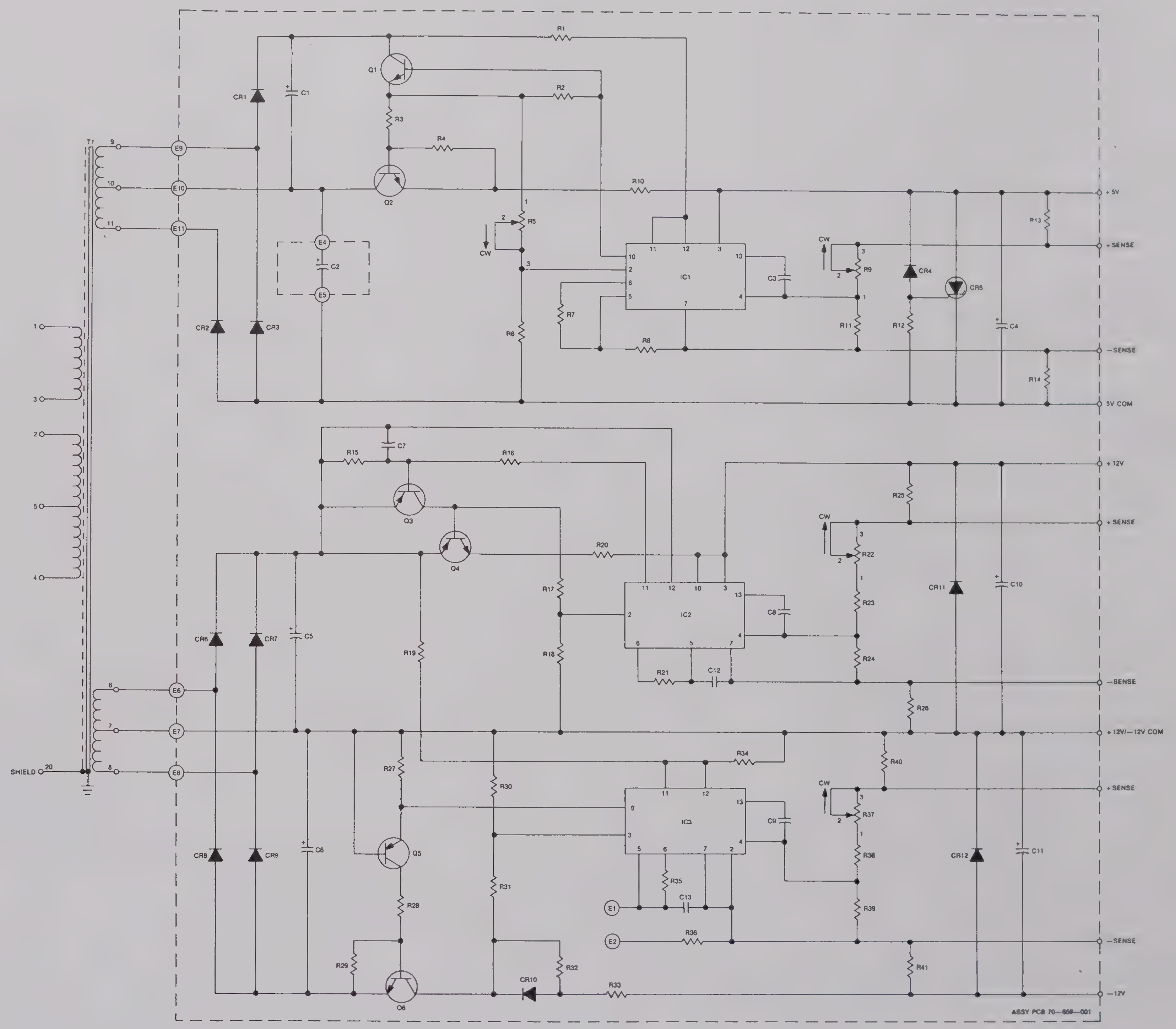
REMOTE SENSING: Available on all outputs.

VIBRATION: Per Mil-Std-810C, method 514.2, proc. X, Curve AW (to 50 Hz)

SHOCK: Per Mil-Std-810B, method 516, proc V

⚠1 All units are factory adjusted for 12 volts outputs. (Adjustment range is 10V to 18V)

*For —5V output, jumper E1 to E2 and adjust output voltage pot



T1
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10
11
SHIELD
20
E1
E2
E4
E5
E6
E7
E8
E9
E10
E11
CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
CR10
CR11
CR12
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
Q1
Q2
Q3
Q4
Q5
Q6
R1
R2
R3
R4
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R7
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R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
R40
R41
IC1
IC2
IC3
CW
+5V
+SENSE
−SENSE
5V COM
+12V
+12V/−12V COM
−12V
ASSY PCB 70—659—001

Figure A-4. +5 V, ± 15 V POWER SUPPLY SCHEMATIC

7.34

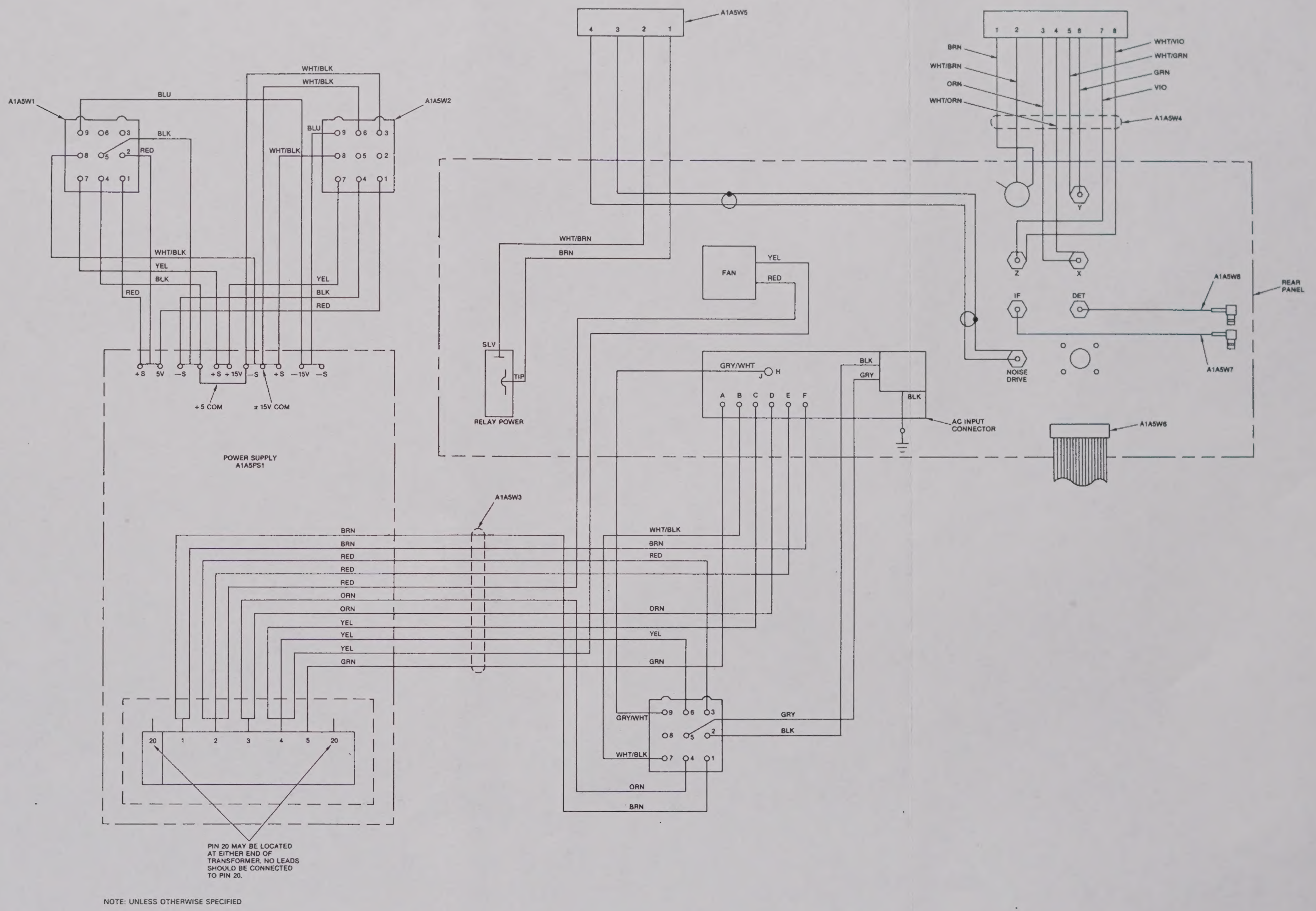
A1A5W1
A1A5W2
A1A5W3
A1A5W4
A1A5W5
A1A5W6
A1A5W7
A1A5W8
BLU
BLK
RED
WHT/BLK
YEL
+S 5V −S +S +15V −S +S −15V −S
+5 COM
± 15V COM
POWER SUPPLY
A1A5PS1
BRN
ORN
GRN
PIN 20 MAY BE LOCATED AT EITHER END OF TRANSFORMER. NO LEADS SHOULD BE CONNECTED TO PIN 20.
NOTE: UNLESS OTHERWISE SPECIFIED
SLV
TIP
RELAY POWER
WHT/BRN
FAN
GRY/WHT
H
J
A B C D E F
GRY
AC INPUT CONNECTOR
WHT/VIO
WHT/GRN
VIO
WHT/ORN
Z
X
Y
IF
DET
NOISE DRIVE
REAR PANEL

Figure A-5. REAR PANEL ASSEMBLY